Agricultural Economics Research

APRIL 1967 Vol. XIX, No. 2

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UNITED STATES DEPARTMENT OF AGRICULTURE • Economic Research Service

Agricultural Economics Research

A Journal of Economic and Statistical Research in the United States Department of Agriculture and Cooperating Agencies

APRIL 1967 Vol. XIX, No. 2

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Pricing Feedlot Services Through Cattle Futures

By Allen B. Paul and William T. Wesson

IT IS NOW commonly accepted that the difference between the prices of grain for spot delivery and deferred delivery is a payment for storing grain. The difference is called the carrying charge or the price of storage. Thus, at harvest time, the prices for deferred grain deliveries exceed the prices for spot grain deliveries by an amount necessary to induce someone to store the grain.[1]

In an analogous way, the spot-forward spread between two forms of a commodity appears to be the market price for converting one form into the other. The authors recently made such a study of the soybean crushing industry (9).[2] It was shown that the spread between spot soybeans and forward soybean products is a competitive price for crushing services.

We now propose to establish that the spot-forward spread involving feeder cattle, feed, and fed cattle is a price for feedlot services. In the case of soybean processing, the value of a bushel of soybeans subtracted from the value of oil and meal derivable therefrom and deliverable at the end of the crushing period is the price of crushing; in the case of cattle, the value of a feeder and feed subtracted from the value of a fed animal derivable therefrom and deliverable at the end of the feeding period is the price of feedlot services. The hypothesis is that there exists a positive and significant relation between this price and quantity of cattle feeding services.[3]

Trading in fed steer futures for Midwest delivery has been continuous since its start on November 30, 1964, and the volume has been substantial. By the end of 1966, there were 16,539 contracts outstanding (15,474 open contracts on the Chicago Mercantile Exchange and 1,065 open contracts on the Chicago Board of Trade). This amounts to about 362,000 steers at 1,150 pounds per steer. If half of these contracts represented feedlot selling (the other half, spreading and speculation) and if the feedlot turnover averaged 5 months, then about 434,000 steers would be involved, on an annual basis. This is 8 percent of the estimated annual slaughter of Choice steers in the North Central States.[4]

While this percentage is small (and it was even smaller near the beginning of futures trading), it can fairly well reflect changing competitive relationships over a wide market area. Since cattle futures trading is new, the sparse historical data on it permit only a tentative interpretation. We need to rely on knowledge from other futures trading, particularly soybeans, to guide our inquiry.

But one must guard against pressing analogies too far. There are important differences between processing soybeans and feeding cattle. The latter process takes more time, can be entered into at almost any stage, and results in a nonstorable commodity. These differences have a bearing on the interpretation and handling of data.

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[1] Strictly speaking, the word "spot" allows no interval between transaction and delivery dates. But in practice, short intervals enter, e.g., 3-day, 5-day, or 10-day shipment of grain. In the present discussion, we use the looser interpretation.

[2] Underscored numbers in parenthesis refer to items in the Bibliography, p. 45.

[3] In the short run, the quantity supplied would also depend on existing feedlot capacity and other factors. In view of the fact that this article examines data for only 2 years, we shall assume that changes in capacity have been relatively small. Some theoretical arguments on how to enter capacity in short-term supply response relations are discussed briefly in (9).

[4] There are no data showing the use of cattle futures for different purposes. In general, the most successful use of the Midwest contracts by feedlot operators would be in the North Central region.

Moreover, recent data show that in the cattle feeding business there exists an extensive system for pricing feedlot services through custom-feeding arrangements. These are the various arrangements entered into by feedlot operators to feed cattle owned by other operators for a fee. Hence, we also need to take the role of custom feeding into account, and show how it resembles and differs from futures trading. This will set the stage for examining the pricing of the feedlot services through futures and the relation of prices and costs. At the conclusion, some general implications of the overall analysis will be given.

Role of Custom Feeding

The rise of large feedlots and custom feeding tend to go together. Williams' recent survey of 15 States (16) shows that more than 40 percent of the cattle marketed by feedlots with capacities of 5,000 head or more were custom fed. Below 5,000 head, the importance of custom feeding tapered off rapidly. Above 30,000 head, custom feeding tended to give way to partnership and other enterprise-sharing arrangements (figure 1).

Logan and King (6), in a study of commercial feedlots in California, found that cattle marketings by 56 identical feedlots increased 87 percent from 1957 to 1963. They concluded that custom feeding accounted for almost all of this increase.

Various studies (5, 16) suggest that costs may be lowered by increasing capacity to 5,000 head. Additional economies in buying, transporting, and selling might be gained in larger operations. Capital requirements for a 5,000-head operation would be relatively large--over $1 million for feed, feeders, and feedlot services.

The need for outside equity is understandable. But the reason why such equity moves into

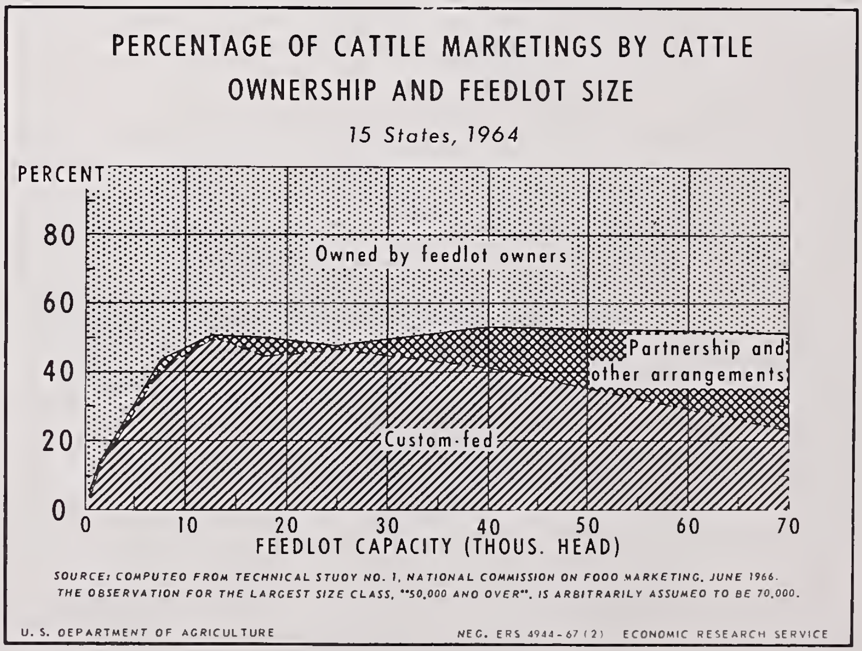

Figure 1

cattle feeding are beyond the scope of this paper.[5] It suffices to observe that large operators attract relatively more outside equity through custom feeding than small operators do, and thus they can use their plant more completely.

This is the view of some students of the industry (6, p. 24; 16, p. 20). It is supported by survey data showing that the ratio of cattle marketings to feedlot capacity rises as the feedlot capacity increases (table 1). In 1964, feedlots with 8,000 head or more capacity had over one-third more turnover than lots with less than 4,000 head capacity.[6]

The financing of production is subject to scale economies. Equity or loan funds usually can be provided more cheaply in large units than in small units, but we do not know the importance of such cost differentials. In any case, data in figure 1 and table 1 suggest that a feeder would need a capacity of about 10,000 head to attract the outside equity needed to operate close to its minimum average cost.[7] Logan and King (6) showed that virtually all the growth in cattle marketings in California between 1958 and 1964 was associated with increased numbers of feedlots with 10,000 head or more capacity. A plausible hypothesis is that financing and not operating economy is the strategic factor in growth of large feedlots.

Table 1.--Ratio of cattle marketings to capacity of feedlot, by capacity size groups, 32 States, 1964 [1]

Capacity of feedlot (head)	Number of feedlots	Ratio of marketings to average capacity of feedlot[2]
1,000 - 1,999..	808	0.84
2,000 - 3,999..	421	.87
4,000 - 7,999..	242	.92
8,000 - 15,999..	120	1.22
16,000 - 31,999..	34	1.33
32,000 and over..	10	(3)

[1] Based on data in (13).

[2] Average capacity is taken to be the midpoint of the class. See text, footnote 6.

[3] Not estimated because the class is open-ended.

Viewed diagrammatically (as an envelope of cost curves for plants of different scales), smaller feedlots operate higher on the descending phase of their own cost curves than large feedlots do. Hence, the differentials in realized costs between small and large feedlots tend to be greater than can be explained by the observable scale economies.

In general, any scheme for financing investment that becomes extensive tends to become institutionalized and to use sophisticated business methods. Financing cattle feeding through custom arrangements has undergone such development. Hopkin and Kramer (3) describe the most prevalent scheme in California: The feedlot operator seeks prospective customers and arranges bank loans on cattle and feed. The customer does not take title to the cattle and he may never lay eyes on them. He signs an agreement to purchase the cattle when they are ready for slaughter, at a cost equal to the original purchase price of the feeders, plus all feeding and handling charges, plus interest. His downpayment is about $30 per head. Unless the client is a packer, the cattle are sold in the name of the feedlot operator and all sales proceeds come to him. The returns above costs

[5] Such examination should focus on the balance-sheet composition of different participants in the cattle business and their asset and liability preferences. The latter would be evaluated in the light of the different conditions facing each group: range of economic opportunities (including tax considerations), uncertainties, and tastes. Questions about risk aversion and risk assumption would be handled in such a context.

[6] The data in table 1 are rough indicators only. Because of the J-shaped distribution, the use of midpoints of class intervals to figure the average turnover rate understates the average, particularly for the smaller size classes. Also, such data take no account of the possible correlation of average feeding period with average feedlot capacity and, therefore, might overstate or understate the differences in feedlot utilization.

[7] The information shown in figure 1 is, conceptually speaking, incomplete. Equity held by partnerships is not distributed between insiders and outsiders. This tends to overstate the importance of outside equity in cattle feeding. On the other hand, the equity of corporate feedlot operations is not distributed between the inside and outside shareholders. Hence, the importance of outside equity is also understated.

Corporate ownership of feedlots increases with the size of feedlot. Most feedlots with 5,000 head or more capacity are owned by corporations (8). Information is lacking on the degree to which outsider interests hold shares in them.

(plus downpayment) are paid to the customer. During 1963 and early 1964, there were many occasions when a net balance was owing to the feedlot operator because the loss was greater than the downpayment.

Such institutionalization of custom dealing shows the features it has in common with futures trading. In each, the buyer puts up a small margin on his commitment to take deferred delivery of a given quality and quantity of fed animals. He stands to gain or lose solely from the change in price of the contract between the time of entry and time of liquidation. The feedlot operator fixes his margin for a given length of feeding period. This margin is secure up to the limits of the buyer's credit worthiness (or the credit that stands behind him). Physical delivery of fed cattle to the buyer may or may not occur, according to the wishes of the participants in the contract; the settlement can be, and often is, purely financial.

Existence of these common features suggests that custom feeding and futures trading are, conceptually speaking, equivalents. This proposition can be shown directly.

Equivalence Between Custom Feeding and Cattle Futures

The equivalence may be shown by separating the futures contract into its two parts, namely, a transaction in (a) a spot commodity and in (b) a bundle of services. In cattle feeding, the spot commodity is some combination of feed and feeder animal. The bundle of services includes all things done to convert the spot commodity into the futures commodity.

Accordingly, the cattle feeding business can be subdivided into two ventures. One venture is to supply fed cattle on a given date; the other is to supply feedlot services during an interval that ends on the same date. (This is like the subdivision of enterprise responsibility that occurs in the construction industry between the "builder" and the "contractor.") Each of the two ventures is defined by its own set of transactions. These may be real transactions or they may be virtual transactions (i.e., the feedlot operator buys certain inputs from himself). A set of transactions may or may not include futures trades. But any two sets are economic equivalents if they give rise to an identical venture.

The argument is shown in table 2. All transactions are entered in December. One who simply ventures to supply fed cattle the following June (row A), but who does not care to supply feedlot services, can do so by purchasing (a) fed cattle futures for June delivery, or (b) feeder cattle and feed for December delivery, and feedlot services for December to June. The equals sign denotes the state of equivalence.

The physical outcome of the venture would be identical if the inputs that were purchased in the custom feeding arrangement, and the output purchased in futures, were elements of the same production function. The cost of the cattle supplied in June would also be identical, assuming perfect arbitrage.[8] For example, when the value of June cattle futures exceeds the combined value of feed, feeder animal, and feedlot services, profit could be made by simultaneously selling the former and buying the latter. Such arbitrage would depress the value of June delivery cattle and raise the value of the inputs until the two would come into line.

Next, in row B, the enterprise of supplying feedlot services is shown in terms of equivalent sets of transactions. The venture might be undertaken through a conventional hedging operation in futures: buy spot delivery of feeders, feed, and other inputs and sell futures delivery of fed cattle. Or it might be done through custom dealings: buy spot feeders and feed for the account of the client (denoted by both purchase and sale transactions, and their cancellation), and buy other inputs and sell custom feeding services. Again, assuming perfect arbitrage and the same production function, the outcome (in terms of quantity, quality, and price) would be the same whether one had entered one set of transactions or the other.

Entries in row C show the "proof." They are the sums of the entries listed in rows A and B. After canceling, both columns contain the identical transactions--buy feeders, buy feed, and buy other inputs. The canceled entries may be viewed as transactions that are internal

[8] Arbitrage is defined by Webster's New International Dictionary as "Simultaneous, or nearly simultaneous, purchasing, as of commodities, securities, or bills of exchange, in one market where the price is lower than in another, and selling in the other".

Table 2.--Equivalent transactions for a given enterprise entered through (a) cattle futures and (b) custom feeding

Enterprise that--	Transactions entered in December for delivery on date shown in the subscript, via--		
	Futures trading		Custom feeding
A. Supplies fed cattle in June	Buy fed cattle$_{\text{June}}$	=	Buy feeders$_{\text{Dec.}}$ Buy feed$_{\text{Dec.}}$ Buy feedlot services$_{\text{Dec.} \rightarrow \text{June}}$
B. Supplies feedlot services, $_{\text{Dec.} \rightarrow \text{June}}$	Buy feeders$_{\text{Dec.}}$	=	~~Buy feeders~~$_{\text{Dec.}}$
	Buy feed$_{\text{Dec.}}$	=	~~Buy feed~~$_{\text{Dec.}}$
	Buy other inputs$_{\text{Dec.} \rightarrow \text{June}}$	=	Buy other inputs$_{\text{Dec.} \rightarrow \text{June}}$
	Sell fed cattle$_{\text{June}}$	=	~~Sell feeders~~$_{\text{Dec.}}$ ~~Sell feed~~$_{\text{Dec.}}$ Sell feedlot services$_{\text{Dec.} \rightarrow \text{June}}$
C. (A + B). Supplies fed cattle in June and feedlot services, $_{\text{Dec.} \rightarrow \text{June}}$	Buy fed cattle$_{\text{June}}$	=	Buy feeders$_{\text{Dec.}}$ Buy feed$_{\text{Dec.}}$ Buy feedlot services$_{\text{Dec.} \rightarrow \text{June}}$
	Buy feeders$_{\text{Dec.}}$	=	Buy feeders$_{\text{Dec.}}$
	Buy feed$_{\text{Dec.}}$	=	Buy feed$_{\text{Dec.}}$
	Buy other inputs$_{\text{Dec.} \rightarrow \text{June}}$	=	Buy other inputs$_{\text{Dec.} \rightarrow \text{June}}$
	Sell fed cattle$_{\text{June}}$	=	Sell feeders$_{\text{Dec.}}$ Sell feed$_{\text{Dec.}}$ Sell feedlot services$_{\text{Dec.} \rightarrow \text{June}}$

to the firm. The remaining transactions are what the ordinary farmer does when he decides to feed cattle--supply the fed cattle in June and the feedlot services from December to June.

The theoretical equivalences between custom dealing and futures trading may or may not be approximated in practice. This is a factual question which would need to be investigated. The problem is complicated by the many considerations of value that enter into the pricing of services.

In custom feeding, the specific terms are largely private matters. In some cases, the feed and feeder animal are supplied by the customer, and a fixed fee per head per day is agreed upon. In others, the operator provides all or part of the feed and this would be charged at cost or at a markup. The feeding charge might be figured per ton of feed or per pound of gain. In still other cases, both feed and animal are supplied by the operator. Innumerable variations in arrangements seem possible (3). If the terms of different transactions were known, it might be possible for the investigator to reduce them to a common basis. For example, in cases where custom feeders provide feed and feeder animals to customers, if these items were not billed at cost, the feeding charge could be adjusted accordingly.

In futures trading, the pricing of services is done through a spot-forward spread which would vary according to location of the feedlot operation (and other features). But by having futures prices for fed cattle at a central location, one could compute the prices for feedlot services at that or at other locations.

Custom feeding is largely a phenomenon of the West and Southwest (table 3), while futures trading is largely undertaken in the Midwest. But the two overlap. Extensive custom feeding is done in the Midwest, particularly in Nebraska and Kansas. Also, futures trading has a small foothold in the West, through a "western delivery" contract, and some thought is being given to adapting the terms to better fit market conditions.

Prices of Feedlot Services

A characteristic of biological and storage processes is that they take time. For this reason, an exchange economy can arrange for ways for the firm to take over the responsibility for them at almost any stage of the process. Thus, the firm can provide few or many services, as it chooses. The fewer the services, the smaller the payment. This feature is shown in figure 2 by the narrowing margin over the 10-month period of production as the target date approaches.

Table 3.--Number of fed cattle marketed, specified States, 1964
(1,000 head)

States	All feedlots[1]	Feedlots with 1,000 head and over	
		Total[1]	Custom fed[2]
Iowa and Nebraska.................	5,405	1,056	318
Kansas and Oklahoma..............	956	485	209
Texas............................	971	849	304
Colorado.........................	951	636	109
Montana, Idaho, Utah, and Nevada..	545	289	41
New Mexico and Arizona...........	766	725	281
California.......................	2,061	2,011	911
Oregon and Washington............	437	263	65
Total, 15 States...........	12,092	6,314	2,238

[1] From (13).
[2] Derived from percentages given in (8, p. 118).

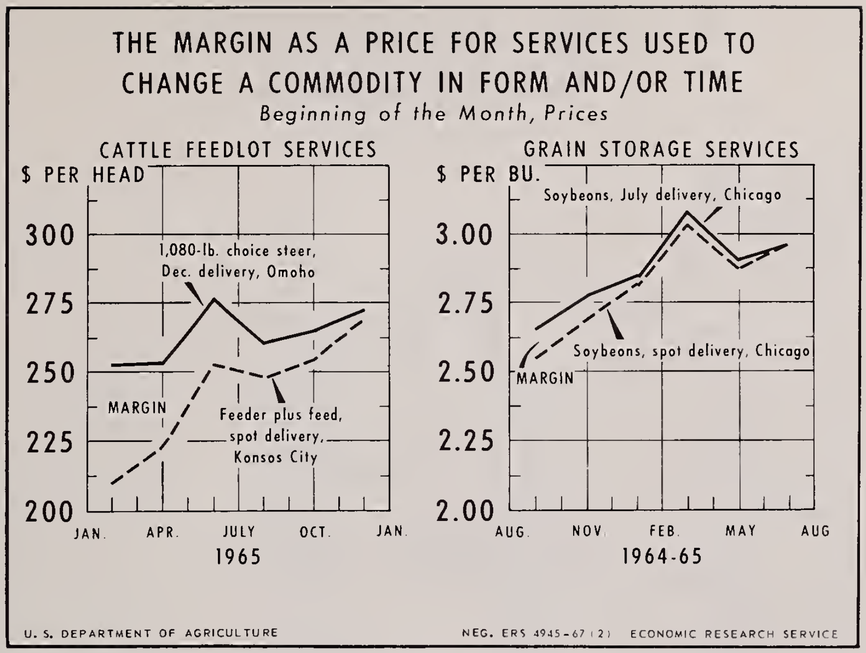

Figure 2

The margin registered on any date before the target date is a competitive price for the bundle of services to be provided to the target date. This price reacts to its own supply and demand forces and is fairly independent of the commodity prices from which it is derived.

Because the enterprise of cattle feeding can be undertaken at almost any stage in the production sequence, one might provide almost any amount of feedlot services decided upon. To produce a 1,080-pound steer for December delivery, a 480-pound calf could be fed for 10 months beginning in February; a 570-pound animal, for 8 months beginning in April; a 675-pound animal, for 6 months beginning in June; an 800-pound animal, for 4 months beginning in August; or a 950-pound animal, for 2 months beginning in October. The appropriate combination of feeder and feed would change with the passage of time. To derive the price for feedlot services of a given duration, one would price the relevant feeder animal and bundle of feed for spot delivery on the date the enterprise would be undertaken, and subtract this sum from the value of a 1,080-pound steer deliverable in December, as this value appears on the former date.

The results for 1965 are shown in figure 2. The solid line represents the value of a 1,080-pound Choice steer for December delivery (at Omaha). The dotted line is the value of the spot feeder and feed appropriate to each date (in the nearby area). The prices of corn and alfalfa are average prices received by farmers in Nebraska and Iowa. The prices of soybean meal are average prices paid by them.[9]

The margin tends to narrow as the year progresses--reflecting less additional services to bring the animal up to target weight. On any given date, the margin is also influenced by competitive forces, i.e., the demands for feedlot services, unused feedlot capacity available, and other conditions of supply.

The pattern is like the classical carrying charge exhibited by grain markets and shown here for soybeans (figure 2). This margin also tends to narrow as the season progresses--reflecting

[9] The price of the 1,080-pound steer is the average closing price for December delivery on the Chicago Mercantile Exchange for the first week of the month, minus 0.75 per cwt. for Omaha delivery. The prices for feeder animals are USDA market quotations at Kansas City, for choice feeder steers of the appropriate range, first week of the month. Prices for feeds were interpolated to represent beginning of the month prices. The weights of feeders, the feed rations, and the weight gain assumptions were predicated on data published in (2, 15).

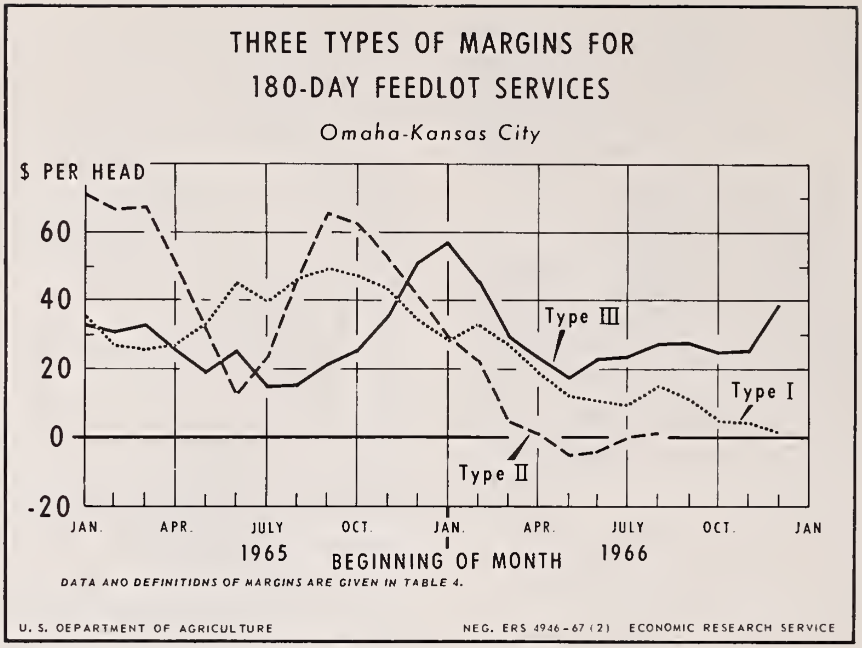

Figure 3

less storage services needed to carry soybeans to the target month. On any given date, the margin also is influenced by competitive forces such as the demand for grain storage, idle bin space, and other conditions of supply. It appears that in both the cattle and soybean illustrations, prices for services implied in the spread are fairly independent of the level of commodity prices.[10]

To show the changing market prices for services over time requires that the bundle of services be held constant. Such price variation should represent true price changes and not changes in qualities. We shall use as a constant the 6 months of feedlot services that are required to produce a Choice steer in the Omaha-Kansas City region. Specifically, 405 pounds of gain would be put on a 675-pound Choice yearling steer, using up 46.6 bushels of corn, 0.51 ton of alfalfa hay, and 180 pounds of soybean oil meal. This would result in a 1,080-pound steer deliverable on the futures contract (15). Any reasonable change in assumptions would not affect the pattern of prices appreciably, although it might change the average level.

This spot-forward spread has been computed at 30-day intervals during 1965 and 1966 and the results are recorded in figure 3 and table 4 as the Type III margin.[11] This spread is one to which producers can react. The implicit assumption, that the fed cattle are in fact delivered on the futures contract, is beside the point. Yet, account can be taken of the fact that most cattle hedged in futures are sold in the cash market and the futures contracts are offset by purchase. This gives rise to what trade jargon calls "basis gains and losses"--adjustments in outcome due to changes in the relative value of specific animals sold in a cash market delivered at a given time, and the value of standard specifications of the futures contract. The major movements of the two series are similar (table 4).

Besides the spot-forward spread, figure 3 shows the feeding margin computed on two traditional bases. One is the anticipated return that would have been realized at the completion of feeding, if the present margin between spot delivery of fed steers and spot feeders plus feed had held (Type I margin). The other margin

[10] Some degree of intercorrelation may exist between the two. See (9).

[11] This margin nomenclature is carried over from (9).

Table 4.--Three types of feeding margin net of feeder steer and feed costs, Omaha-Kansas City basis, Choice grade steers, 1965 and 1966

(Dollars per head)

Decision date (week ending)	Type I [1]	Type II [2]	Type III, with futures settled by--	
			Delivery [3]	Offset [4]
1965:				
Jan. 9	35.26	71.11	32.34	
Feb. 6	26.47	66.43	30.25	36.62
Mar. 6	24.96	67.62	32.41	
April 3	26.27	51.44	25.41	34.70
May 8	33.53	31.91	19.06	
June 5	45.00	17.78	25.02	21.46
July 3	39.10	23.66	15.56	
Aug. 7	46.03	46.14	15.68	12.77
Sept. 4	48.67	65.73	21.78	
Oct. 7	47.56	62.25	25.96	26.93
Nov. 6	42.36	52.51	35.88	
Dec. 4	34.05	40.53	51.44	53.82
Av. Jan.-Dec	37.44	49.76	27.56	--
1966:				
Jan. 8	28.12	28.98	56.52	
Feb. 5	32.29	22.03	45.68	50.65
Mar. 5	30.82	5.66	29.42	
April 2	27.03	1.11	23.46	20.11
May 7	19.24	-5.38	17.73	
June 4	12.08	-4.01	22.56	16.30
July 9	9.71	-.01	23.43	
Aug. 6	14.54	1.15	27.28	28.90
Sept. 3	11.31	--	27.72	
Oct. 8	5.92	--	24.60	
Nov. 5	4.63	--	25.37	
Dec. 3	1.32	--	38.37	
Av. Jan.-Dec	16.42	--	30.18	--
Av. Jan.-Aug	21.73	6.19	30.77	--

[1] Price on decision date for spot delivery of feed and feeder steer subtracted from price on the same date for spot delivery of fed steer.

[2] Price on decision date for spot delivery of feed and feeder steer subtracted from price 6 months later for spot delivery of fed steer, at that time.

[3] Price on decision date for spot delivery of feed and feeder steer subtracted from price on the same date for delivery of fed steer 6 months later. (The latter price for January and for alternate months were interpolated from prices for fed steers for delivery 5 and 7 months later.)

[4] Same as footnote 3, but adjusted for disparities between the cash and the maturing futures prices during the first week of the futures delivery month.

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is the realized return between what was paid for feeders and feed on one date and what was received for the fed animal 6 months later (Type II margin). The three types of margins show quite different patterns.

Production Response to Price

While most fed cattle marketings in the North Central States have not been committed under forward transactions, cattle that have been committed might reflect competitive valuations at large. On this assumption, one can test the hypothesis that in the short run a low price for cattle feeding services would be associated with a small production response, and vice versa. Do feedlot margins computed as spot-forward price spreads show this relation? Is the fit any better than can be obtained by using anticipated margins, computed as a spread between concurrent spot prices?

The answers are shown in figure 4. The quarterly placements of cattle on feed in the North Central States during 1965 and 1966 are plotted against the quarterly margins. For present purposes we leave aside determinants of production other than price. When the spot-forward margin is used, the scatter suggests a classical supply-response curve, whereas using the concurrent spot margin, the scatter does not show this pattern. While the model may be too simple and the results do not "prove" the hypothesis, they are suggestive. They are similar to the results obtained for soybean processing services (9).

As additional data become available, there can be additional tests. One might try other measures of the spot-forward spread--e.g., feeding intervals shorter or longer than 6 months. Also, some refinement of the quantity variable might be made. Feedlot capacity and other factors affecting short-run supply of services should be included in the model. The interactions among variables should be investigated, using a system of equations.

The observed variations in prices and production in figure 4 are largely seasonal. High prices and placements occur in the fall. It would require more years of data to test whether the observed simple regression between price and quantity holds for annual, cyclical, and secular changes, and to test the explanatory power of more complete models.

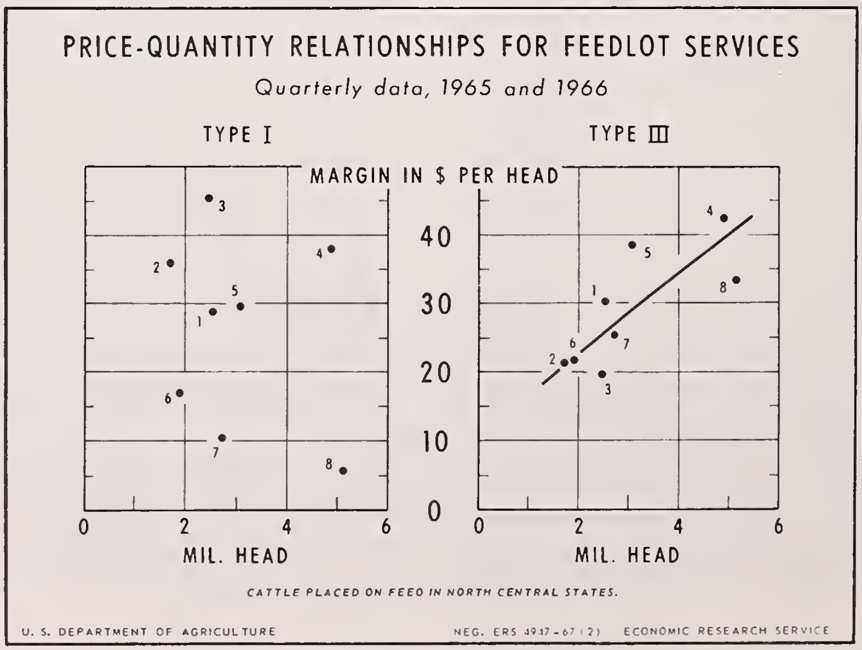

Figure 4

Table 5.--Costs of feeding operations, by size of feedlot

(Cents per head per day)

Source of data	Feedlot capacity: Number of head						
	100	500	1,000	2,500	5,000	7,500	10,000
Illinois[1]..........	13.4	--	--	--	--	--	--
California[2]........	--	--	--	14.2	11.2	9.8	9.3
Oklahoma[3]..........	--	14.5	12.1	11.5	10.6	10.4	10.2

[1] From (7); accounting data submitted by sample of operators. A marketing cost for fed cattle has been added from data provided by (15). The 100-head capacity is approximate.

[2] From (3); accounting data submitted by sample of operators. Includes 1.2 cents to cover death losses. Interpolations of original data.

[3] From (17); synthetic budget estimates. Some data are interpolated.

Relation of Prices and Costs

How do the implicit prices for feedlot services compare with costs of producing the services? We draw on data from three recent studies that are most complete with respect to the costs that have been included for feedlots of different sizes (table 5). To make better comparisons, the cost data have been adjusted, where necessary, to include allowances for death losses and marketing charges. Also, the figures for given size feedlots have been interpolated and put on a "per head per day" basis.

The figures shown in table 5 are generally consistent. Small lots have relatively high unit costs--about 14 cents per head per day as compared with about 10 cents per head per day for the larger feedlots. Cost figures suggested by the Oklahoma and California studies (17, 3) for feedlots with under 5,000 head capacity might differ, in part, because the former is a budget study that assumes full utilization of facilities while the latter is a report of accounting records. Specifically, lots with over 5,000 head capacity may show a smaller discrepancy because big feedlot operators can better arrange to keep their feedlots full through custom feeding, as suggested before. The Illinois study is based on relatively small feedlots that are treated as part of a general farming enterprise. They enjoy certain cost advantages that tend to hold costs down for the small operator (14).

The implicit prices for 180-day feedlot services, for steers produced in the Iowa-Nebraska region, averaged $27.56 per head in 1965 and $30.18 in 1966 (table 4). On a per head per day basis, these are 15.3 cents and 16.8 cents, respectively. They are sufficient to cover all the costs of the feedlot operations shown above net of feed and feeder animals. To obtain such results, however, would have required that the cattle be hedged in futures in uniform volume throughout each year. This conclusion also seems to hold when basis gains and losses are taken into account.

The price-cost comparison is a first approximation. The costs of buying and transporting feeder cattle to the feedlot are not included in table 5. Also, commercial feedlots that purchase virtually all their concentrated might incur a higher cost of feed than we used. Those that buy corn not immediately available in the neighborhood might incur a marketing charge of 15 cents per bushel above prices received by farmers.[12] This is $7 per head (0.15 times 46.6 bushels), or 3.9 cents per head per day. It would leave 11.4 cents for 1965 and 12.9 cents for 1966, to cover costs. On the other hand, there were opportunities to save 1 cent per head by fixing corn and soybean oilmeal prices in futures, when forward deliveries within the 180-day feeding period were at a discount under nearby deliveries. For example, when a feeding project is undertaken, one-third of the required feed might be purchased for immediate delivery, one-third

[12] The average cost per bushel for rail movement of corn within Nebraska and within Iowa was about 11 cents per bushel, according to ICC waybill data. Gross margins realized by country gain elevators, judging by Illinois data (10), may have been 3-1/2 to 5 cents per bushel.

for 60-day delivery, and one-third for 120-day delivery. These futures positions would be later offset when cash feed was purchased. The net gain from this market maneuver would depend on the size of the discount, the costs of on-premise storage, and changes in the basis between futures prices and cash prices. These and perhaps other factors would need to be appraised to learn more about the behavior of differently situated feedlot operators.

Conclusions and Implications

We showed why futures trading in cattle may be viewed as a means of pricing feedlot services and that, in this role, it is like custom feeding. Both are responses to a common set of forces. Both promote specialization of production, enlargement of scale, and fuller utilization of facilities.

Apparently, the underlying need is to mobilize capital for an industry whose rapid rate of expansion depends on reduction of costs. Both futures trading and custom feeding attract outside equity by partitioning the cattle feeding business into two different ventures: (1) supply fed cattle and (2) supply feedlot services. This partitioning allows outsiders to undertake responsibility for the former.

The other way to attract outside equity is to divide the cattle feeding enterprise into equal shares and to sell some to outsiders. Each share would represent an equal stake in the combined venture of supplying fed cattle and feedlot services. Partnership and corporate organizations are the institutional means of making such partitions.[13]

The large corporation with its permanent capital and its widespread shareholding can meet the need for continuous financing. But this begs the question. The question is whether an efficient corporate portfolio would include ownership of cattle. This is a complex matter to analyze and, as indicated before, lies beyond the reach of this paper.

Also, there is the question about the vertical coordination of the many specialized production processes that compose the feed-livestock-meat economy. Futures and custom contracts are vehicles for pricing commodities and the specialized services that enter into commodities. Corporate shares are primarily vehicles for pricing the yield prospects of a pool of capital. Futures trading and custom feeding seem inherently more capable of improving the coordination of the specialized production processes. These are important ideas to pursue, but they too extend beyond the scope of this paper.

Futures trading has several advantages over custom feeding. Organized futures trading is more accessible to some outsiders than custom feeding services. Its hallmark is the machinery for safeguarding the integrity of the contract, which enables loans to be made more freely against given collateral, and with more safety. Thus, the stranger can be fitted into the scheme with relative ease.

Also, futures trading gives the feedlot operator greater flexibility in changing his enterprise position; he can shorten or lengthen his ownership position in cattle overnight. In this respect, custom feeding arrangements are clumsy.

Futures trading may fit the small feeder as well as the large one and in this way might have more beneficial effects than custom feeding. The farmer who feeds (say) 200 to 500 head annually and has profitable alternatives for capital could benefit from fixing his feeding margin in advance through futures. If he were assured a margin of $30 per head above feed and feeder costs, the annual total would be from $6,000 to $15,000. It might be the annual increment he would need to commit himself to additional land, buildings, or equipment.

In general, extension of futures trading depends on overcoming some major difficulties. These include (1) difficulties of adapting futures contracts to suit different feeding situations without undue loss of precision; (2) problems of creating a larger body of informed hedgers and informed speculators; and (3) problems of developing hedging intermediaries to serve the smaller scale feeder--livestock dealers, packers, or others who may be in a position to offer the farmer a firm forward contract for (say) 200 head, take delivery, and make a mutually satisfactory settlement.

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[13] Conceptually, partnerships and corporations might limit their interest to either supplying fed cattle or supplying feedlot services. This compounds the ways of drawing on outside equity.

A lesson that cattle futures teaches concerns the origins of futures trading. A widespread belief, shared by the authors, is that a precondition for successful futures trading is the existence of extensive cash forward dealings in the commodity. The origins of grain futures in "to arrive" contracts and the origins of futures trading in eggs and butter in various cash dealings show this clearly (4). In more recent times, it is shown by the development of soybean and soybean oil and meal futures from extensive cash forward trading in these commodities. Extensive cash forward dealings in a commodity are presumptive evidence of the economic need for more standardized trading methods.

But futures trading in fed cattle evidently has developed without appreciable cash forward trading in fed cattle. What did exist were extensive dealings in feedlot services. Apparently, we should generalize more broadly: a precondition for successful futures trading in a commodity is the existence of extensive transactions in some economic equivalent, whether it be dealings in the commodity itself or in services that enter into production of the commodity. A separate question of course is whether futures trading could be made technically feasible.

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Estimating the Demand for Truck and Rail Transportation: A Case Study of California Lettuce

By Walter Miklius

IN THE PAST, research in transportation economics mainly focused on supply. Despite the almost universal adoption of demand-oriented pricing by transportation industries and regulatory bodies, demand received relatively little attention.

However, the apparent neglect of demand is being remedied. This is evidenced by two recent studies on demand for transportation services, one by Perle and one by Benishay and Whitaker.[1] Interest in demand is timely because of expanding transport opportunities provided by intermodal competition as well as increasing use of private carriers. As a result, the traditional use of the value of the commodity (alone or in conjunction with transport cost as a percentage of the price of the commodity at destination) as an indicator of the elasticity of demand for transport is increasingly less reliable.

The main differences between the studies cited above and the one reported in this paper are in the level of aggregation and the nature of the data. Both of the above studies dealt with the demand for transport services at national or regional levels and utilized time series data. For many purposes, however, knowledge of demand at a much less aggregated level is necessary.

This study follows an earlier one by Limmer.[2] It examines further the possibility of estimating demand for truck and rail transport services at the commodity level by using data from a cross-sectional sample of destinations for shipments from one origin. Unlike prices of other commodities, freight rates exhibit enough cross-sectional variation at a given point in time to permit the use of cross-sectional analysis in measuring the response to differences in them. Furthermore, the ability to use cross-sectional data is important since such data can be collected through sampling if time series data are not available.

Sources and Nature of Data

The U.S. Department of Agriculture collects data on rail and truck unloads of fresh fruits and vegetables at the major U.S. cities. These data were utilized in this study. The output measures for transport services are number of cars for rail and number of carlot equivalents for trucks. The commodity being transported is lettuce, originating in California and unloaded at selected out-of-State destinations during 1964. The truck unload data were adjusted for incomplete coverage of unload reports.

Actual freight rates were used as a price measure. Several rail freight rates were in effect in 1964, depending on the minimum weight of the shipment. The freight rate applicable to the weighted average weight of shipments was used.[3]

Truck freight rates were obtained from shippers, truck brokers, and truckers located in California. Since interstate truck transportation

[1] E. D. Perle, "The Demand for Transportation: Regional and Commodity Studies in the United States," Univ. Chicago, 1964, and H. Benishay and G. R. Whitaker, Jr., "Demand and Supply in Freight Transportation," Jour. Indus. Econ. Vol. 14, July 1966, pp. 243-260.

[2] E. Limmer, "The Elasticity of Demand for Railroad Transportation of Florida Produce," Jour. Farm Econ. Vol. 37, Aug. 1955, pp. 452-460.

[3] The estimated weighted average weight of rail carloads of lettuce shipped from California was 37,812 pounds. The rate applicable to the minimum weight of 36,000 pounds was used. Weighted average weight computed from data supplied by the Southern Pacific Company.

of lettuce is exempt from economic regulation by the Interstate Commerce Commission, truck freight rates fluctuate in response to changes in supply and demand in the transport markets.[4] Therefore, instead of a single rate to each destination, a number of quoted rates were obtained. In order to minimize the effect of variation in quotations, modal instead of average rates were used.

All freight rates were converted from per standard container or per 100 pounds to per ton-mile, and they included the refrigeration charge. The choice and number of out-of-State destinations were limited by the availability of truck freight rates. The sample included 30 major U.S. population centers, most of which are east of the Mississippi River.

The Model

It was assumed that California lettuce shippers have an effective choice between truck and rail transport services to all destinations considered. Therefore, it could be expected that shippers' decisions to utilize one mode rather than another would be based on truck and rail rates. Factors other than rates, however, may affect the quantities shipped by each mode. First, the size of the market for California lettuce may have an independent effect on shipments by either mode. Other things being equal, the larger the market, the more shipments one can expect by each mode. Second, a preliminary analysis indicated possible regional differences. The destinations, therefore, were divided into two groups, those in the North Central and Northeast regions, and those in the Southern region, and a dummy variable was added to stand for the possible effect of the destination region.

Single-equation regressions were applied since both price variables are assumed to be predetermined. The rail rate is regulated and independent of the quantity of lettuce moving to any single market. Truck rates, although established in a competitive market, can be assumed to be predetermined because they depend on the movement of all agricultural commodities from all origins to all destinations.

The size of market variable is also assumed to be predetermined. This is equivalent to an assumption that the demand for spatial movement of lettuce is infinitely inelastic with respect to transport charges. This assumption in turn does not appear to be unreasonable considering that the demand for lettuce is inelastic (available estimates at wholesale range from -0.34 to -0.50) and the transport charges account for a small percentage of the price at destination.

Initial investigation did not provide any strong indications of an appropriate mathematical form for the estimating equation. The demand relationship, therefore, was assumed to be linear in the logarithms for all variables, that is, the estimated elasticity coefficients were assumed to be constant. The following two estimating equations, for rail and truck services respectively, were used:

$$\text{Log } Q_r = a + b_1 \log P_r + b_2 \log P_m + b_3 \log Q_t + b_4 D$$

$$\text{Log } Q_m = a + b_5 \log P_r + b_6 \log P_m + b_7 \log Q_t + b_8 D$$

where:

Q_r = shipments by rail in cars

Q_m = shipments by truck in carlot equivalents

Q_t = size of the market (i.e., total shipments, $Q_r + Q_m$)

P_r = rail freight rate in cents per ton-mile

P_m = truck freight rate in cents per ton-mile

D = dummy variable for possible effect of destination region; values assigned where 1 for destinations in the North Central and Northeast regions and zero for destinations in the Southern region.

[4] Some of the variation can be attributed to the manner of quoting rates. Shipping charges are frequently negotiated on a per load rather than a per container basis. Sometimes the refrigeration charge is included in the quoted rate; at other times it is an extra.

The expected values of coefficients, other than constant terms and dummy variable, are as follows:

Rail	*Truck*
$b_1 < 0$	$b_5 > 0$
$b_2 > 0$	$b_6 < 0$
$b_3 > 0$	$b_7 > 0$

The level for allowing variables to enter the regression equation was specified at F = 1.00.

Empirical Estimates

The statistical results for rail transport services were:

$$\text{Log } Q_r = \underset{}{2.98} - \underset{(0.99)}{8.70 \log P_r} + \underset{(0.20)}{0.73 \log Q_t} + \underset{(0.12)}{0.27\, D} \tag{1}$$

$$R^2 = 0.86$$

Results for truck transport services were:

$$\text{Log } Q_m = 0.49 - \underset{(2.08)}{8.51 \log P_m} + \underset{(0.98)}{6.54 \log P_r} + \underset{(0.20)}{1.10 \log Q_t} - \underset{(0.11)}{0.59\, D} \tag{2}$$

$$R^2 = 0.83$$

The variables included in the model explained most of the variance in the rail and truck shipments, and all of the regression coefficients of entering variables were significantly different from zero in the expected direction. The demand for services of both modes appeared to be relatively elastic with respect to freight rates.

The size of market coefficient was about the same for both modes, indicating that both were affected proportionally. The coefficient of the dummy variable, on the other hand, indicated fewer truck shipments, ceteris paribus, to the North Central and Northeastern destinations than to the Southern destinations, and vice versa for rails. The most plausible explanation for the regional differences refers to the type of facilities utilized. In the North Central and Northeastern destinations, older facilities are more adapted to handling rail traffic.

Two problems, however, should be noted. First, it may be argued that the relatively high R^2 is due to expected high correlation between Q_r or Q_m and Q_t. Since $Q_t = Q_r + Q_m$, the correlation is between "a part" and "a whole." To check this effect, total lettuce shipments from California (Q_t) were replaced with total lettuce shipments to a given market from all origins, Q_u.

The statistical results were as follows:

$$\text{Log } Q_r = 3.14 - \underset{(0.99)}{8.51 \log P_r} + \underset{(0.19)}{0.69 \log Q_u} + \underset{(0.12)}{0.25\, D} \tag{3}$$

$$R^2 = 0.86$$

and

$$\text{Log } Q_m = 0.27 - \underset{(2.28)}{9.39 \log P_m} + \underset{(1.06)}{6.83 \log P_r} + \underset{(0.20)}{0.97 \log Q_u} - \underset{(0.13)}{0.61\, D} \tag{4}$$

$$R^2 = 0.80$$

These results, however, could have been expected if California supplied some constant percentage of the total. Although the percentage of the total lettuce supplied by California in various markets varied between 40 and 80 percent, it was desirable to replace Q_u with a variable independent of lettuce shipments. Thus, 1964 population estimates (P_o) were used.[5]

[5] U.S. Bureau of the Census, Population Estimates, Series P-25, No. 330, March 21, 1966, pp. 10-17. Population of cities not included in the above publication estimated from the 1960-64 percentage change in the nearest included city. 1960 population estimates from U.S. Bureau of the Census, United States Census of Population 1960, Final Report, PC(1)-1A, 1961, pp. 1-105.

The statistical results were:

$$\text{Log } Q_r = \underset{}{2.80} - \underset{(1.04)}{7.71} \log P_r + \underset{(0.18)}{0.65} \log P_o + \underset{(0.12)}{0.22}\, D \qquad (5)$$

$R^2 = 0.85$

and

$$\text{Log } Q_m = 0.31 - \underset{(2.36)}{9.97} \log P_m + \underset{(1.13)}{7.97} \log P_r + \underset{(0.20)}{0.91} \log P_o - \underset{(0.13)}{0.65}\, D \qquad (6)$$

$R^2 = 0.79$

Changes in results were negligible. The P_r and P_m coefficients remained relatively stable.

The second problem was the failure of truck freight rates to enter regression equations (1), (3), and (5). This could not have been a result of high collinearity because the simple correlation coefficient between P_m and P_r was only 0.10. Examination of unexplained residuals, however, suggested that the log-linear form may not have been most appropriate for rail shipments. Regression equations (1), (3), and (5) were repeated using natural numbers rather than logs. The statistical results were:

$$Q_r = 247.89 - \underset{(123.91)}{1079.55}\, P_r + \underset{(248.86)}{733.76}\, P_m + \underset{(0.04)}{0.87}\, Q_t + \underset{(70.07)}{146.91}\, D \qquad (1a)$$

$R^2 = 0.98$

$$Q_r = 1775.00 - \underset{(143.49)}{941.35}\, P_r + \underset{(0.02)}{0.42}\, Q_u + \underset{(80.53)}{136.72}\, D \qquad (3a)$$

$R^2 = 0.97$

$$Q_r = 201.69 - \underset{(266.04)}{581.57}\, P_r + \underset{(136.83)}{342.49}\, P_m + \underset{(0.02)}{0.38}\, P_o + \underset{(86.98)}{142.87}\, D \qquad (5a)$$

$R^2 = 0.96$

Truck freight rate coefficients are now statistically significant in equations (1a) and (5a). Furthermore, the substantial increases in R^2 indicate that the linear equations using natural numbers give better fit for rail shipments. There was, however, very little change when regression equations (2), (4), and (6) were changed to natural numbers:

$$Q_m = -247.82 - \underset{(248.86)}{733.79}\, P_m + \underset{(123.91)}{1079.54}\, P_r + \underset{(0.04)}{0.13}\, Q_t - \underset{(70.07)}{146.91}\, D \qquad (2a)$$

$R^2 = 0.80$

$$Q_m = -117.28 - \underset{(256.54)}{797.17}\, P_m + \underset{(126.63)}{1096.01}\, P_r + \underset{(0.02)}{0.06}\, Q_u - \underset{(71.10)}{145.23}\, D \qquad (4a)$$

$R^2 = 0.80$

$$Q_m = -254.05 - \underset{(266.04)}{722.26}\, P_m + \underset{(136.08)}{1141.51}\, P_r + \underset{(0.02)}{0.05}\, P_o - \underset{(73.97)}{139.91}\, D \qquad (6a)$$

R = 0.78

The following elasticity of demand coefficients at the centroid were obtained by means of the equations specified:

For rail services		For truck services	
Equation	Coefficient	Equation	Coefficient
(1a)	-3.19	(2a)	-4.74
(3a)	-2.98	(4a)	-5.08
(5a)	-1.97	(6a)	-3.36

The cross-elasticity of demand at the centroid for each mode was +1.00, implying relative ease in substituting the services.

The estimated elasticity of demand coefficients are larger than those obtained in the two recent studies mentioned above (see footnote 1). This could be attributed to differences in the level of aggregation and the nature of the data. The elasticity coefficients calculated from cross-sectional data are likely to pertain to the long run and those from time series data

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to the short run.[6] The estimates, however, are comparable to the following elasticity of demand coefficients for rail services estimated by Limmer for Florida produce:[7]

Oranges	-1.9	Celery	-3.6
Grapefruit	-2.2	Corn, green	-2.5
Snap beans	-2.8	Potatoes	-2.8
Cabbage	-3.3	Tomatoes	-2.7

[6] E. Kuh and J. R. Meyer, "How Extraneous are Extraneous Estimates?" Rev. Econ. and Statis., Vol. 39, Nov. 1957, pp. 380-393.

[7] E. Limmer, op. cit., p. 454.

Conclusions

The demand for transportation services of each mode, rail and truck, for California lettuce seems to be relatively elastic with respect to its own freight rates, and of unit elasticity with respect to the rates of the competing mode. The demand for truck services is relatively more elastic than that for rail services. Further work would be needed to test whether these results can be generalized to other commodities. They do indicate, however, that the estimation of demand for transport services from cross-sectional data may be feasible.

U.S. Agricultural Exports and Foreign Economic Growth

by John R. Schaub and Arthur B. Mackie

THE EXPORT MARKET is becoming increasingly important to U.S. agriculture. From calendar 1957 to 1966, total agricultural exports increased 53 percent, from $4.5 to $6.9 billion. Commercial agricultural exports were responsible for 98 percent of the total increase. Exports under Government programs increased only slightly (fig. 1).

The rapid growth of commercial exports has increased the stake of the American farmer in the export market. The factors responsible for the upsurge of commercial exports are ill defined, making explanations of the past and predictions of future levels of exports difficult. Need for research in this area is strongly indicated.

Lack of detailed knowledge of the export market has increased the difficulty of evaluating U.S. domestic and foreign policies. More knowledge about economic forces in the commercial agricultural export market will provide a basis for improved policies and programs. This paper attempts to fill some of the informational gaps by analyzing the propensity of foreign countries to import U.S. farm products, the characteristics of their aggregate import function, and some of the problems in predicting the aggregate demand for U.S. commercial agricultural exports.

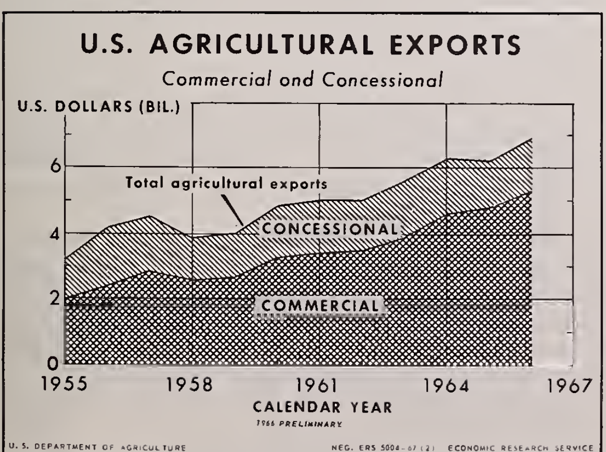

Figure 1

Previous research has demonstrated that there is a definite and positive relationship between income and imports of foreign countries. One study (6),[1] using 1959-61 data, estimated import elasticities of 1.1 for all commodities and 1.3 for commercial agricultural products from the United States. A separate study by Chenery (2), which used 1952-54 data, obtained an elasticity approaching 1.0 for all imports.

Increases in imports are directly related to the income level in importing countries, but the nature of this relationship may change with income level. Two well-known economic concepts suggest that the import-income relationship may not be constant for all income levels. Keynesian economics implies, in terms of consumption, that the marginal propensity to consume decreases as incomes increase. This theory, as well as a portion of "Engel's Law" (a declining percentage of income is expended for food as incomes increase), has possible implications for an import-income relationship. In addition, in the above-mentioned empirical studies, linear equations in logarithms were used to estimate the income coefficients. This suggests that the income-import relationship varies with level of income and that it may be nonlinear in actual values.

The writings of several economists (1, 4, 5, 7) suggest a declining marginal propensity to import as per capita incomes rise, but a precise statement of this hypothesis and an empirical evaluation of it are lacking. In this

[1] Underscored numbers in parentheses refer to items in the Literature Cited, p. 59.

paper, we test the hypothesis that the marginal propensity to import agricultural products commercially declines as foreign per capita incomes rise. Imports of U.S. products are used as an example.

A declining marginal propensity to import agricultural products might exist as a result of the development of a self-sufficient agriculture, or as a result of slower growth in demand for food and fiber at high levels of income. We only attempt to determine whether there is a declining marginal import propensity. We did not study possible factors which may cause such a relationship. The results should be useful in predicting aggregate demand for imports and lend more credibility to the estimate than mere extrapolation. The paper does not attempt to completely define the import function nor does it investigate individual country variations which might result from such factors as price differences, domestic supply, balance of payments positions, distance, and domestic and foreign government policies.

The main objective of this paper is to investigate the relationships between per capita income of importing countries and per capita commercial agricultural imports from the United States for different levels of development. More specifically this main objective includes the following:

1. To determine the absolute level of per capita agricultural imports (all agricultural, commercial agricultural, and imports under Government programs) of U.S. exports for low-, medium-, and high-income countries;
2. To measure the expenditure for commercial agricultural products of U.S. products in relation to income (import elasticities), both cross-sectionally and over time;
3. To test the hypothesis that the commercial import expenditures for agricultural products from the United States, in relation to per capita income, decline as income increases;
4. To indicate the use of the estimated elasticities for predicting aggregate exports of U.S. farm products for some future period.

Method of Analysis

Countries and time periods.--The period from 1957 to 1964 was chosen for analysis. Both 1957 and 1964 are points in time when world economic conditions were fairly similar and stable. Also, 1957 represents a peak period, relative to 1958 and 1959, in agricultural exports (see fig. 1), consequently insuring an element of conservatism in the analysis. Specifically, 1957 represents (1) a period 3 years after the beginning of the P.L. 480 program, (2) the highest level of P.L. 480 exports prior to 1961, and (3) a period of transition from food aid programs designed primarily to assist developed countries to those aimed at helping the less developed countries. The year 1964 is the most recent period for which adequate trade and income data are available.

The 66 countries included in this study, in both 1957 and 1964, accounted for more than 82 percent of total U.S. agricultural exports. Also these countries represented 84.8 percent of U.S. commercial exports in 1957 and 81.4 percent in 1964. In both 1957 and 1964, these 66 countries participated in approximately 80 percent of total world agricultural trade (8).

Determination of income levels.--The 66 countries were arbitrarily divided into three income categories, based on their 1964 income positions which represent developmental levels.[2] The income or developmental levels chosen were low (less than $200 per capita income), medium ($200 to $600 per capita income), and high (more than $600 per capita income). An analysis of variance was performed for 1957 and 1964 to determine whether the level of imports was significantly different for each developmental level. This test showed that for both time periods, the difference in level of imports for each income category was highly significant.

[2] Less than $200 per capita income--Bolivia, Brazil, Burma, Ceylon, Dominican Republic, Ecuador, Egypt (U.A.R.), Ghana, Honduras, India, Iran, Jordan, Korea, Morocco, Pakistan, Paraguay, Peru, Philippines, Sudan, Taiwan, Thailand.

$200 to $600 per capita income--Argentina, Barbados, British Guiana, Chile, Colombia, Costa Rica, Cyprus, El Salvador, Greece, Guatemala, Iraq, Jamaica, Japan, Lebanon, Libya, Malta & Gozo, Malaya, Mauritius, Mexico, Nicaragua, Panama, Portugal, Republic of South Africa, Spain, Trinidad, Uruguay, Yugoslavia.

More than $ 600 per capita income--Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, Iceland, Ireland, Israel, Italy, New Zealand, Norway, Sweden, Switzerland, United Kingdom, Venezuela, West Germany.

Two methods of calculating the average per capita income and imports for each development level were considered:

$$\frac{1}{N}\sum_{i}^{N}\frac{Y_i}{P_i} \quad \text{and} \quad \frac{\sum_{i}^{N} Y_i}{\sum_{i}^{N} P_i}$$

with Y being either imports or income and P being population. The latter method was used to insure that population units were of equal importance in the development level.

Calculation of elasticities.--Three methods of calculating import elasticities were used. In the cross-sectional analysis, the income coefficient was calculated by using the function $y = \alpha x^b$ computed in logarithmic form. This function was used because of the ease of obtaining the point elasticity estimate and because it provided a better fit to the data than any of the other functions tried.

An arc elasticity measure was used to estimate the import elasticity by income level for the interval from 1957 to 1964. Also, elasticities were measured by income level using a time series approach. The point elasticity estimates were obtained from linear equations in logarithms. Countries were categorized into income levels on the basis of their relative income positions in 1964. Thus, the country composition of each income level in a particular year was identical to the country composition in any other year.

Analytical Results

One way of viewing U.S. agricultural exports is by studying foreign countries' imports of U.S. products. The data in table 1 provide the reader with some idea of the magnitude of changes in foreign countries' imports of U.S. agricultural products over time as they undergo economic growth.

Table 1.--Per capita value of agricultural imports from the United States, 66 countries by per capita income level, 1957 and 1964[1]

(U.S. dollars)

Item	Low-income countries[2]		Medium-income countries[2]		High-income countries[2]	
	1957	1964	1957	1964	1957	1964
All agricultural imports............	0.93	1.59	3.66	4.18	7.59	8.33
Commercial agricultural imports......	.20	.30	2.35	3.48	6.14	7.88
Concessional imports (under U.S. Government export programs)........	.73	1.29	1.31	.70	1.45	.45
Income..............................	88	100	262	460	831	1,261

[1] Trade data adjusted for transhipments through Canada. Transhipment data were obtained from Thomas A. Warden, "Transshipments of U.S. Agricultural Products Through Canada," Foreign Agricultural Trade of the United States, December 1966.

[2] Countries were categorized according to 1964 income levels as follows: Low level of development or income, less than \$200 per capita income; medium level of development or income, \$200 to \$600 per capita income; high level of development or income, more than \$600 per capita income.

Sources: U.S. Dept. Agr., Foreign Agricultural Trade of the United States; Internatl. Monetary Fund, International Financial Statistics; and United Nations, Statistical Yearbook, 1964.

In 1957 and 1964, the high-income countries had the largest per capita imports for all agricultural products and for commercial products. The medium-income countries had the second largest per capita imports, while the low-income countries imported the least in both years. Concessional imports (imports under U.S. Government programs) were important for all income groups in 1957, but the magnitude of these imports decreased in the medium-and high-income countries in 1964.

In terms of absolute changes in imports from 1957 to 1964, the high-income countries had the largest per capita increase ($0.74) in all agricultural imports, while the medium- and low-income countries had increases of $0.52 and $0.66 per capita, respectively. In terms of commercial agricultural imports from the United States, the high-income countries increased their imports by $1.74 per capita, and the medium- and low-income countries increased imports by $1.13 and $0.10 per capita, respectively. The low-income countries increased their concessional imports by $0.56 per capita while the medium- and high-income countries decreased their concessional imports by $0.61 and $1, respectively. Consequently, the increase in all agricultural imports in the low-income countries was primarily through concessional sales, whereas commercial imports were of primary importance in the medium- and high-income countries. In fact, the large increases in commercial imports and the substantial decreases in concessional imports per capita in the middle- and high-income countries suggest that countries with these levels of income have been able to substitute commercial for concessional imports, as the latter were phased out.

Import Elasticity Estimates [3]

The elasticity estimates were obtained by using the equation $m = \alpha y^b$ in logarithmic form computed by simple least squares. In this instance, the estimated b is also an elasticity estimate (ϵ). The relation of the elasticity estimate (b) to the marginal propensity to import (mpm) is shown below:

$$\frac{d}{dy}(\alpha y^b) = b\alpha y^{b-1} = \text{mpm}$$

$$\frac{d}{dy}(\text{mpm}) = b\alpha(b-1)\ y^{b-2}$$

$$= \text{rate of change in mpm.}$$

By simply substituting alternative values for b (or in this case ϵ) it can be shown that if:

$0<\epsilon<1$	the mpm is decreasing at a decreasing rate
$1<\epsilon<2$	the mpm is increasing at a decreasing rate
$2<\epsilon<\infty$	the mpm is increasing at an increasing rate
$\epsilon=0$	the mpm = 0
$\epsilon=1$	the mpm $=\alpha$ and is independent of the income level
$\epsilon=2$	the mpm = $2\alpha y$ or increases at a constant rate

Thus, by knowing the sign and magnitude of the elasticity, one can make a statement regarding the marginal propensity to import.

The cross-sectional analysis suggests that the import function increases at a decreasing rate as per capita income rises. Both the arc and time series elasticity estimates indicate that the marginal propensity to import declines with rising per capita incomes. The three elasticity estimates strongly suggest that the proposed hypothesis of a declining marginal propensity to import is correct. Furthermore, there is an implication that a cross-sectional elasticity estimate for all countries will understate the true import elasticity for the less developed countries and overstate the true import elasticity for the highly developed countries. These implications mean that the cross-sectional elasticity estimate for all countries has limitations for predictive purposes, especially if the period for which the predictions are being made is very distant from the period from which the cross-sectional estimate was derived.

Cross-sectional analysis.--The cross-sectional analysis yielded results which were consistent with previous research, in that per

[3] The authors wish to thank W. Y. Mo for his help in developing the ideas in this section.

capita income was found to be an important variable in explaining per capita commercial agricultural imports from the United States. However, all the point elasticity estimates were greater than 1.0 (see unadjusted data, table 2) and fail to substantiate a hypothesis of declining marginal propensity to import. But these elasticity estimates do state that even if the marginal propensity to import (mpm) is increasing, it is increasing at a decreasing rate. Since many of the elasticity estimates are less than 1.5, it can be expected that the rate of increase in the mpm will drop rather quickly at high income levels.

It was felt that the way in which the commercial export values are derived might be partly responsible for the failure to substantiate the hypothesis of declining marginal propensity to import when using cross-sectional data. Commercial agricultural exports are derived as follows: (Total agricultural exports to country$_i$) - (exports under Government programs to country$_i$) = commercial agricultural exports to country$_i$. This determination of commercial exports may create a downward bias in the commercial export estimates, as donations under Title II of P.L. 480 are valued at Commodity Credit Corporation costs which are generally above market value (3).

This downward bias could affect an elasticity estimate, particularly since countries receiving concessional shipments are at the lower end of the income scale.

An attempt was made to overcome these problems in the following way. In each cross section, a line was fitted for total exports and commercial exports (as defined above) for all countries whose commercial agricultural imports accounted for less than 95 percent of total agricultural imports. The expected import levels were predicted by using the estimated total and commercial export equations. The average of these predictions for each country was then used as an adjusted import figure. The entire cross-section was then reestimated in a linear equation in logarithms. The results of this estimation are shown in table 2 (adjusted data). The elasticity estimates obtained by using

Table 2.--Estimates of imports elasticities, unadjusted and adjusted data, 1957-64

Year	Unadjusted data			Adjusted data[1]		
	[2] B	α	R^2	[2] B	α	R^2
1957.........	1.51552 (0.20186)	-3.64675	0.49	1.18907 (0.09374)	-2,68062	0.73
1958.........	1.48745 (0.19788)	-3.68146	0.48	1.26651 (0.10736)	-2.96809	0.70
1959.........	1.55869 (0.18256)	-3.83579	0.54	1.19213 (0.11466)	-2.78694	0.64
1960.........	1.43802 (0.15708)	-3.46367	0.57	1.24111 (0.08955)	-2.85609	0.75
1961.........	1.47238 (0.15734)	-3.54194	0.59	1.23058 (0.11956)	-2.81980	0.63
1962.........	1.25530 (0.14493)	-2.95415	0.54	1.12334 (0.09119)	-2.51939	0.71
1963.........	1.43229 (0.15604	-3.46793	0.58	1.03794 (0.09344)	-2.32051	-0.66
1964.........	1.24295 (0.15252)	-2.92013	0.48	1.01250 (0.06374)	-2.16401	0.80

[1] See text for adjusting procedures.
[2] Standard errors appear in parentheses.

the adjusted data are greater than 1.0, but less than the estimates obtained by using unadjusted data. The adjusted data do indicate that lower elasticities would result if the bias were removed. Since the elasticity estimates obtained with the adjusted data are still greater than 1.0 and because the adjustment is crude, no further use was made of the data.

Table 2 shows that the cross-sectional elasticity estimates tend to decrease over time. Since the mean incomes increase over time, an inverse relationship is suggested between the magnitude of the elasticity and the mean income. Correlation of the mean income to the estimated elasticity with both adjusted and unadjusted data resulted in a negative correlation coefficient and a small but significant regression coefficient.[4] These results suggest that, with continuing increases in per capita incomes, the import elasticity and consequently the marginal propensity to import will decrease.

Arc elasticity estimates.--Arc elasticity estimates were calculated by income level for the interval between 1957 and 1964. The estimates, 3.13 for low levels of development and 0.74 and 0.60 for middle and highly developed countries, indicate that the import elasticity decreases as development occurs and strongly suggest a declining marginal propensity to import.

Time series.--In the time series analysis by income levels, a linear equation in logarithms was again used for estimation purposes. The results of this series of estimations support a hypothesis of declining marginal propensity to import. The low-income group had an import elasticity of 2.49, the middle-income group 1.05, and the high-income group 0.78. These results (shown in table 3) are consistent with the declining marginal propensity hypothesis, since imports would increase at an increasing rate at the low level of development (2.49), increase at a decreasing rate at the medium level of development (1.05), and decrease at a decreasing rate at the high-income level of development (0.78).

[4] $\bar{Y} = 2.23 - \underset{(0.0008)}{0.0026}\, b$ (unadjusted) $R^2 = 0.62$

$\bar{Y} = 1.935 - \underset{(0.0004)}{0.0025}\, b$ (adjusted) $R^2 = 0.81$

Table 3.--Results of time series analysis, unadjusted data, 1957-64

Income level	Estimates of --		R^2
	α	b	
Low..........	-5.53100	2.48717 (0.84731)	0.59
Medium........	-2.23632	1.04806 (0.20438)	0.81
High..........	-1.52452	0.77978 (0.16515)	.79

Estimates of U.S. Commercial Agricultural Exports

The analysis in this paper can be used to predict aggregate commercial agricultural exports for the United States. Results of two methods of prediction are presented here. One method uses the time series functional relationships shown in table 3. The other method uses the following predictive formula:

$$M^*_{t+1} = \left[\left(\frac{Y_{t+1} - Y_t}{Y_t}\right) E\, M_t + M_t\right] P_{t+1}$$

where:

Y = income per capita
E = elasticity estimate
M = commercial agricultural imports per capita
M*= aggregate commercial imports
P = population

The above formula was used, with both cross-sectional and time series elasticity estimates and a different assumption concerning population and income growth for each income level, to predict U.S. commercial agricultural exports.

Actual and predicted 1965 exports are shown in table 4. The export estimate ($4.88 billion) obtained with cross-sectional elasticities most nearly approached actual exports ($4.78 billion). The second best estimates ($4.93 billion) were

Table 4.--U.S. commercial agricultural exports, predicted and actual for 1965

(Billion U.S. dollars)

Method used to make predictions	Predicted commercial exports to--		Actual [2]	Difference [3]
	66 countries	All countries [1]		
Predictive formula:				
With 1964 cross-sectional elasticity estimates [4]	3.98	4.88	4.78	+.10
With arc elasticity estimates	4.02	4.93	4.78	+.15
With time series estimates	4.06	4.98	4.78	+.20
Time series function	4.02	4.93	4.78	+.15

[1] The 66 countries included in the study accounted for 81.5 percent of all commercial imports of U.S. commercial agricultural exports in 1964. It was assumed that these countries maintained this share in 1965. The estimate for all countries was calculated by dividing the estimates for 66 countries by 0.815.

[2] Foreign Agricultural Trade of the United States, U.S. Dept. Agr., July 1966 issue.

[3] Difference calculated by subtracting actual exports from predicted exports.

[4] Mean per capita income and population predicted on an aggregate basis.

obtained by using the arc elasticities and the time series function.

Estimated exports for 1970.--Estimates of U.S. commercial agricultural exports were made for 1970 assuming the same rate of (1) population growth as occurred from 1963 to 1964, and (2) per capita income growth as occurred from 1957 to 1964, slightly modified.

The 1966 and 1970 population estimates were made assuming the same annual growth rate by income level as occurred from 1963 to 1964. The average population growth was assumed to be 2.61 percent per year in the low-income countries, 1.25 percent in the medium-income countries, and 1.24 percent in the high-income countries.

Cross-sectional elasticities were used in the predictive formula with the mean per capita income estimated on an aggregate rather than a country-by-country basis.

Income growth per capita per year was assumed to be 2.0 percent in low-income countries, 6.0 percent in medium-income countries, and 5.0 percent in high-income countries. These assumed rates are somewhat different from the actual growth rates, which were 1.82 percent for the low-income group, and 8.4 and 6.2 percent for the medium and high groups.

Because both inflationary and real income changes are incorporated in the income growth rates, per capita incomes in foreign countries are estimated in current U.S. dollars.

Commercial and total agricultural exports for 1970 are shown in table 5. These estimates were calculated in the same way as the estimates in the preceding section. The estimates for commercial exports range from $5.15 billion to $5.47 billion for the 66 countries included in this study. The most conservative import estimate for 1970 ($5.15 billion) was obtained by using arc elasticity estimates. The predictive formula with time series elasticities gave a higher commercial export prediction ($5.47 billion). As indicated earlier, the use of a cross-sectional elasticity estimate may be inappropriate since we have shown that the import elasticity tends to decline at higher income levels, resulting in a declining marginal propensity to import. Thus, the use of time series elasticities in making long-term predictions would be less likely to overstate the projection level of U.S. commercial agricultural exports.

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Table 5.--U.S. agricultural exports predicted for 1970

(Billions of 1970 U.S. dollars)

Methods used to make predictions	Commercial exports to--		Concessional exports	Total[2]
	66 countries	All countries[1]		
Predictive formula:				
With arc elasticity estimates................	5.15	6.31	1.94	8.25
With cross-sectional elasticity estimates.....	5.41	6.64	1.94	8.58
With time series elasticity estimates........	5.47	6.71	1.94	8.65
Time series function..........................	5.40	6.63	1.94	8.57

[1] The 66 countries included in the study account for 81.5 percent of all commercial imports of U.S. commercial agricultural exports. It was assumed that these countries maintained this share in 1970. The estimate for all countries was calculated by dividing the estimate for 66 countries by 0.815.

[2] Total exports consists of commercial plus concessional exports (exports under Government programs). For 1970, $1.94 billion was added to the commercial export estimate to obtain the total estimate. The concessional exports were $1.5 billion in 1957 and $1.72 billion in 1964. The increase in concessional exports represents a growth of approximately 2 percent per year. To estimate concessional exports for 1970, it was assumed that the 2 percent growth would continue.

If one wishes to estimate all agricultural exports from the United States, it is necessary to include concessional shipments. The level of concessional exports can be influenced by other than purely economic factors. Policy considerations are very important in determining levels of concessional exports and these are subject to change.[5] The concessional export number for 1970 was obtained by assuming that concessional exports will continue to increase at the same rate as they increased from 1957 to 1964, or approximately 2 percent per year. Assuming a 2 percent per year compound growth in concessional exports, an estimate of $1.94 billion was obtained for 1970. Thus, the sum of estimated commercial plus estimated concessional exports equals a predicted total for agricultural exports in 1970 of at least $8.25 billion and maybe as high as $8.65 billion.[6]

[5] For example, the Food for Peace Act of 1966.

[6] These estimates slightly exceed those made by Quentin M. West (9), who used a different methodology.

Conclusions

The analysis in this paper, though limited, agrees with previous analyses which emphasized the importance of per capita income in determining import levels. In addition, the analysis indicates that the marginal propensity to import commercial agricultural products declines as per capita incomes rise in importing countries. There is a need for further empirical testing to better define and specify import functions for aggregate agricultural products, as well as for commodity groups. Further research should be concerned with identifying those causal variables associated with per capita income growth that affect the propensity to import, and with developing more precise methods of categorizing and aggregating countries into development levels.

The commercial import response varies with per capita income levels, indicating a declining marginal propensity to import. The time series import response from 1957 to 1964 was 24.8 percent for the low, 10.5 percent for the

medium, and 7.8 percent for the high-income groups for each 10 percent increase in per capita income. However, in terms of absolute imports, the high-income countries will continue to be the best markets. But, given sustained economic growth, the lower-income countries will have tremendous potential as markets for U.S. commercial agricultural products.

If the relationships described in this paper prevail and foreign economic growth continues, the results obtained suggest that commercial U.S. agricultural exports will exceed $6.0 billion by 1970 and may reach $6.71 billion. These amounts are suggested regardless of the predictive methods used or the manner in which the elasticity was estimated. Any major increase in concessional shipments or trade with the Eastern Trade Area, or a major change in international trade policies, would affect these estimated amounts.

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Book Reviews

Atlantic Agricultural Unity: Is It Possible?

By John O. Coppock. McGraw-Hill Book Company, New York. 1966. 238 pages. $7.50.

THE TITLE OF Coppock's book should contain two questions: "Is it possible?" and "Is it necessary?" The degree to which agricultural unity in the Atlantic region is possible to achieve depends very much upon the degree to which it is deemed necessary.

The author argues persuasively that "no industrialized nation faces ruin because of its own farm problems or because of agricultural policies across its borders." As long as agricultural policies, no matter how "irrational," are kept within national boundaries there is little to complain about "except for the economic purist." But agricultural trade in temperate food products (the main category of agricultural commodities considered by Coppock) is important, and this is what gives rise to international concern about harmonizing national agricultural policies. Further, Coppock asserts that the Treaty of Rome called attention to the problems of international trade in temperate agricultural commodities in the Atlantic region and to the need for nations to follow less restrictive domestic policies.

After assessing the relative rates of growth in agricultural production and consumption under restrictive, high-price policies, Coppock concludes that the Western European countries will achieve a higher degree of agricultural self-sufficiency than they now possess. All this points to a deterioration in national resource use and conditions for international trade.

Why then haven't the nations of the Atlantic Community been willing to modify national agricultural policies toward a less protectionistic, freer trade situation? This question is never fully answered. I would like to suggest one possible answer that could come, but does not, from Coppock's framework of analysis. Trade in temperate zone agricultural commodities has progressed rather favorably in the last two decades. Further, although importing countries are likely to achieve a higher degree of total agricultural self-sufficiency in the future, this does not necessarily imply that the absolute level of trade will decline. And, as long as there are prospects for expansion in the absolute level of trade, it may not really be necessary or desirable for governments to go through the painful processes of radically altering agricultural policy structures. Arguments about what could exist do not seem to be overly compelling when what exists isn't really so bad.

Coppock is somewhat critical of the United States for pushing the Kennedy Round of trade negotiations when it has had what he considers to be a rather rigid and protectionistic set of agricultural policies and has shown little willingness to change or negotiate these policies. I think this is a distorted view of the agricultural policies of the United States, particularly as they relate to international trade. The United States has formulated and implemented policies which go a long way toward the ideal objectives for agricultural policy that Coppock sets forth. The United States has responsibly restrained agricultural output, and managed surplus stocks in such a way as to enable it to follow orderly pricing policies at home and abroad. Price and income support policy programs have been changed, in part, to disassociate income support for agriculture from the price mechanism through the use of direct payments. The result has been a market pricing policy geared to efficient producers. Thus, in recent years the United States has moved a long way toward the policy objectives Coppock would like to see achieved. This does not mean that the United States has achieved a "lily white" set of agricultural policies. It does, however, suggest that

some of the next moves toward policy harmonization in the Atlantic Community might be made by some of the Western European countries.

Martin E. Abel

Agricultural Production and the Economic Development of Japan, 1873-1922

By James I. Nakamura. Princeton University Press, Princeton, N.J. 1966. 257 pages. $7.50.

JAPAN'S ECONOMIC DEVELOPMENT has been considered unique. On the basis of government statistics, economists have regarded it as rapid, with a sudden increase in agricultural productivity in the middle 1880's and an extensive transfer of labor and capital to the nonagricultural sector. After a systematic reexamination of these statistics, Nakamura questions their accuracy and denies the validity of the conclusions based upon them. Consequently, as James W. Morley suggests in the foreword, this is a "revolutionary" study, dispelling "much of the mystery which surrounded Japan's miraculous 'take off' in the Meiji period" and requiring a revision of current views concerning the uniqueness of Japan's economic growth.

The author has three principal objectives: "first, to demonstrate that Japanese government statistics seriously understate the value of production in the early Meiji era and thereby to criticize previous estimates of Meiji national product which accepted these statistics with little or no modification; second, to work out new estimates of the growth rate of the Japanese economy and, more particularly, the growth rate of Japan's agricultural production from 1873-77 to 1918-22; and finally, to examine some of the implications of the new findings."

He demonstrates in fulfilling his first objective that Japanese farmers during the early Meiji period, from 1873 to 1885, in an effort to lighten the payment of land taxes underreported the area of their farms and the yields of their fields. They underreported their land area by means of concealment, misclassification, and undermeasurement. However, the Land Tax Law of 1884 reduced these evasions and added to the tax rolls a considerable acreage of land. About the same time, an improvement was made in the reporting of yields. These increases in acreage and yields in the middle 1880's account for the spurt which economic historians have taken for an acceleration of productivity. Nakamura concludes that annual agricultural growth rates of 1.9 and 2.4 percent advanced by Bruce F. Johnston and Kazushi Ohkawa are too high. He believes that it was 1.0 percent or approximately one-half of their estimates. Consequently, he would revise the growth rate of the Japanese economy as a whole between 1878-82 to 1913-17 from Ohkawa's 4.0 percent to 2.8 percent.

In his final chapter, Nakamura presents some implications of his corrected estimates. Since the economic growth rate was slower, he concludes that the transfer of labor from the agricultural to the nonagricultural was not as much as formerly contended and that the transfer of capital from one sector to the other came not so much from the increment of agricultural income as from the savings of the new landowning class created by the Meiji Restoration. In fact, he suggests that this revolution provided the matrix for subsequent economic growth.

In questioning the uniqueness of the Japanese economic experience, he has furnished the statesmen of developing nations with a more accurate description of their Asian model and a more realistic comprehension of economic development.

Robert G. Dunbar

British Agricultural Marketing, A Study in Government Policy

By V. S. Patvardhan. Asia Publishing House, New York. 1966. 156 pages. $7.50.

THE BOOK DESCRIBES the development of government's role in British agriculture from the 1920's through the 1950's. The role of government during this period changed from that of passive onlooker to active attempts to cope with problems of agriculture through public policy. The main problems of agriculture in Britain appear to have been the growing income disparity between the agricultural and other sectors of the economy and a desire to

ensure some kind of balance between imports and home production.

Reliance of public policy on various commodity marketing schemes, however, created other problems. Among these were (1) high cost of production of certain commodities (e.g. milk, eggs, etc.) associated with small-scale production units; (2) oversupplies of some commodities; (3) high prices to consumers.

The book provides a good description of various commodity marketing schemes (for milk, potatoes, eggs, hops, wool, and tomatoes and cucumbers), functions, organizations, and operations of different commodity boards and other marketing organizations (e.g., Fatstock Marketing Corporation) in the United Kingdom. The lack of rigorous economic analysis of the effects of the board activities, however, limits the usefulness of the study to that of comparing similarities and differences in problems of agriculture in the United States with those in the United Kingdom as well as similarities and differences in the solutions sought.

Walter Miklius

On the Theory and Measurement of Technological Change

By Murray Brown. Cambridge University Press, New York. 214 pages. 1966. $8.50.

IT IS INCONTROVERTIBLE that technological change is only one of many factors which generate economic growth and affect the employment and the distribution of income. Yet, dividing these factors into separate measurable components is still a difficult problem. Consequently, measurement of technological change and the related underlying theories have become important areas of investigation in the recent literature of econometrics. To some extent, Brown makes his excellent book an outstanding contribution to this growing literature by bringing the basic material together. However, the emphasis of the book, as the author himself points out, is with the benefits to measurement provided by a theoretical framework rather than with the benefits to the theory provided by the measures of technological progress.

The book is divided into three parts. The first part is devoted to setting forth the basic theoretical frameworks which are essential for the discussion and interpretation of various measures of technological change developed in the second part of the book. In the third part, the author presents an empirical investigation of measuring the effects of technological change on output, employment, and distribution of income in the U.S. domestic private nonfarm sector from 1890 to 1960.

Qualitatively, technological change is simply the force or factor causing the shift of a production function. In order to clarify the notion of technological change within the quantitative measurement framework, the author defines the technology embedded in a production function in terms of four measurable properties: (1) the degree of efficiency of a technology, (2) the degree of returns to scale associated with the ruling technology, (3) the degree to which technology is capital or labor intensive, and (4) the degree of ease with which the technology permits capital to be substituted for labor. These four characteristics are referred to as "abstract technology" by the author. The first two characteristics are "neutral" technological change, because changes in these two characteristics do not affect the marginal rate of substitution of labor for capital. But changes in the last two characteristics do alter the marginal rate of substitution; therefore they belong to "nonneutral" technological change.

In light of these characteristics, both the Cobb-Douglas and constant elasticity of substitution (CES) production functions are examined and analyzed in great detail with respect to their properties and relationships of the variations in output, labor, capital, and technological change. The author discusses the concepts of short-run, long-run, and secular production processes and the distinction between the embodied and disembodied technological change.

Having explored various theoretical facets of technological change, the author turns to the problems of measuring technological change in the second part of the book. The limitation and applicability of productive index, Solow measure, and Salter measure of technological progress are evaluated. Then, the method of obtaining epochal estimates of parameters in the Cobb-Douglas and CES production functions and the finite differencing method of separating the effect on the change in output of the separate

forces--changes in inputs, neutral technological change, and nonneutral technological change--are presented.

In part III, the author presents an empirical application of some of the measurement techniques developed in part II to the investigations of (1) the effect on economic growth in the United States of neutral and nonneutral technological progress, (2) the effects on employment of the change in output, the substitution of capital for labor, and technological progress, and (3) the effect on relative income shares of technological change and the relative supplies of capital and labor.

On the whole, the book is well organized with a very careful combination of theory, methodology, and empirical results. Although fully understanding the book requires mathematical reasoning and background, the book is clear, well written, and easy to read. The author develops his material in depth and with rigor. The quality of each chapter is high; many readers will find this book worthwhile.

William Y. Mo

Science and Economic Development: New Patterns of Living

By Richard L. Meier. The M.I.T. Press, Cambridge, Mass. Second Edition Revised and Updated (first paperback edition). 273 pages. 1966. $2.45.

THIS IS AN APPRAISAL of possible future development of new economic resources for the rapidly growing population, organized into five chapters titled: (1) The Present World Predicament, (2) New Foods, (3) New Fuels, (4) New Patterns of Living, and (5) Recapitulation. The book's appendix presents a challenge to several professions to solve some "unsolved, but apparently soluble, problems" which would make the feeding, clothing, and maintenance of increasing populations possible, thereby postponing the Malthusian dilemma at least temporarily. If modifications of present foods, fuels, and living conditions are made, according to the author, the earth could adequately support about 50 billion people. This study is somewhat marginal in its shelf appeal to most economists, but deserves a space on bookshelves of most research-oriented physical scientists and sociologists.

The author gives the reader some indication of the adjustment required in our present pattern of living in order to support a larger population. Changes would not only affect our consumption and living patterns, but our entire culture. A comprehensive picture is drawn of the possibilities of future economic development in the fields of foods and fuels with brief glances at problems of automation, birth control, clothing, communications, housing, industry, minimum adequate living standard, power, transportation, urbanization, and others.

The reviewer is of the opinion that the book loses something because of the attempt to be precise. Precision is admirable where it can be achieved or even approximated, but is open to criticism where it is subject to so many different variables. For example, an error of about 100 percent occurred in the projected estimate (table 23) made in the first edition of this book 10 years ago. It may have been more productive to give less precise yet directional forecasts of the future.

Some criticism also applies to data. The use of the metric system in most of the tables confuses the reader and should have been avoided. Many tables and figures appear without any reference or explanation as to their derivation. Some data are out of date.

This study fills a needed vacuum in scientific literature and is recommended to readers as a stimulating mental exercise and a good science-fiction work which may be much closer to the reality than we may realize or even want to admit.

Valentine Zabijaka

Consumer Demand in the United States, 1929-1970--Analyses and Projections

By H. S. Houthakker and Lester D. Taylor. Harvard University Press, Cambridge, Mass. 214 pages. 1966. $6.

THIS MONOGRAPH presents an econometric demand study for the detailed items of private consumption expenditures in the National Income Accounts. The authors analyzed more

than 80 commodities over the 1929-61 period and projected them individually to 1970.

The book appeals to three types of users: those wanting 1970 projections of expenditures, those looking for models to be used in making other projections, and those concerned with the conceptual forefront of econometric analysis of time-series data. A major segment of the book is devoted to presentation of results. It includes one or two models for each item and charts giving actual and predicted values for 1929-70.

The study employed a dynamic model which proved useful for a majority of the items. The dynamic model enabled the measurement of either habit formation (positive addition to consumption) or inventory adjustment (negative effect on consumption). For example, habit formation in the case of food consumption allows food consumption to continue expanding after income has leveled. The model was fitted using ordinary least squares except when autocorrelation was a problem. Then, the three-pass least squares technique was used. Monte Carlo experiments showed that the three-pass least squares technique resulted in less bias in fitting the dynamic model, but it was not as efficient as ordinary least squares. Several sections of the book were devoted to development of the model, testing its dynamic properties, and discussing projection problems.

Current dollar figures were divided by constant (1954) dollar data in deriving indexes of implicit price deflators. The deflators were used as price indexes, and constant dollar expenditures were used as estimates of consumption. Such indexes reflect shifting weights of various components over time, rather than the Laspeyres index method of fixed price weights for quantity indexes and fixed quantity weights for price indexes. Use of shifting weights has the advantage of ensuring that price times quantity equals expenditures. But it glosses over the problem of interaction of price and quantity. The interaction is imputed to either price or quantity, depending on method of estimation. The results of using the dynamic model indicated that consumption was generally more affected by habit than by prices. This conclusion was attributed to our increasingly affluent society, but perhaps use of implicit price indexes was partly responsible. Switching to purchase of higher valued items during 1929-61 may be one reason that the price variables were not statistically significant for many items. In fact, the model for food yielded a positive price elasticity.

The study was conducted under contract with the U.S. Bureau of Labor Statistics. The principal source of data was the Survey of Current Business, U.S. Department of Commerce. Additional unpublished detail was provided by the Office of Business Economics, USDC. These data were revised in 1965 on the basis of 1958 census data. At that time, OBE redefined the concept of total personal consumption expenditures, the most important independent variable in the analysis and the control total used in the 1970 projection. Personal interest payments and transfers abroad were eliminated from personal consumption expenditures. These revisions plus use of later data may warrant users to rerun the basic models when possible. The 1970 projections spring from initial conditions in 1961 (without adjustment for errors) which depend heavily on relationships derived from the 1954 census.

Revised data show that the percentage of total expenditures going for food in 1961 amounted to 21.5 percent rather than the 20.9 percent used in this study. This percentage was projected to decline to 19.6 percent in 1970, but it did so in 1966. The revised data were published for 1929-65 in a supplement to the Survey of Current Business in August 1966. Detailed implicit price deflators were included in the new report but some of the data used by Houthakker and Taylor have never been published. For example, published data for off-premise food expenditures include alcoholic beverages. But this study excluded alcoholic beverages from food. Even though this definition of food is often the more desirable, it makes application or rerun of the model difficult since the historic data used were not included in the monograph.

All in all, the book appears to be an excellent econometric analysis. But I feel that the authors were overstating the usefulness of the dynamic model when they concluded that the days of the static approach to demand analysis appeared to be numbered.

Stephen J. Hiemstra

The Economics of Health

By Herbert E. Klarman. Columbia University Press, New York. 200 pages. 1965. $3.95.

ANY SOLUTION to health problems would serve to help people in rural areas who are at a disadvantage in receiving adequate health care because of low incomes and limited access to medical facilities.

The object of this book is to interest economists in the health field and to encourage the use of economic principles and techniques to resolve problems in the health industry. The author was commissioned by the Ford Foundation to explore the new concept of health economics. This concept is much broader than medical economics since it is not solely restricted to analyzing costs of medical care, but includes analysis of conditions helpful to medical research, the economic costs of diseases, and returns from investment in medical education and training.

The author rightly states that more economic answers are needed to prevent impending crises such as the inadequate supply of trained personnel to accommodate the rising demand for medical attention. However, this reviewer takes issue with the author's reasoning that economists have ignored the field of health and medical services because its special characteristics are exceptions to the economic propositions that explain the behavior of the market. Economists for years have been analyzing extreme cases of imperfect markets and arriving at meaningful and useful results.

The health industry has numerous characteristics which distinguish it from more perfect markets. The difficulty in analyzing the market is increased when, as the author points out, normative economists try to include the formulation of goals and priorities for public policy. The author does a good job in highlighting some of the characteristics contributing to this difficulty, such as that the profit motive in the medical industry is not relevant as an explanation of economic behavior, and that the health industry is a mixture of consumption and investment. Health and medical services are consumption activities, but preventive medicine is an investment activity.

The usefulness of the book is enhanced by the construction of an index of health care costs. This index serves to adjust the data on health expenditures to reflect improvements in the quality of health services. The book has an excellent and extensive bibliography for those who wish to pursue the economics of health further.

Jack Ben-Rubin

What's Ahead for the Family Farm?

By The National Farm Institute. Iowa State University Press, Ames. 156 pages. 1966. $3.50.

THIS VOLUME brings together papers by 14 highly qualified speakers at the conference on this important farm policy issue sponsored by the National Farm Institute early in 1966. The conference proceedings include panel discussions of questions related to the papers. A careful study of this book permits the reader to become a full participant in the meeting.

The book is timely. There is a need to discuss all aspects of the future of the family farm, since the subject is controversial, with a broad spectrum of opinions. In this respect, the National Farm Institute has commendably achieved its objective.

The authors, all concerned with the development of a sound agricultural industry, present their appraisals of the important aspects influencing the future family farm development in an objective and well-documented manner. The family farm is properly defined and examined with respect to changing structure of agriculture over the next 15 years. Technological and business knowledge needs, supply and source needs, market structure needs, and the expected supply of and demand for agricultural commodities in the domestic and world markets are among the topics explored. International as well as domestic influences on the development of the U.S. agricultural economy provide the proper setting for the comprehensive examination of the needs and potentials of the future family farm.

The two papers contributed by Congressmen (representative of the two major political parties) were devoid of politics and demonstrated their keen understanding of the present and future problems of the family farm. Their constructive suggestions for strengthening farm programs should be given serious consideration by everyone concerned with agricultural policy.

The successful farm operator of the future will be required to make appreciable increases in capital input and to become much more scientifically oriented with respect to farm supplies and services. All farm supply and service organizations will have to gear their operations to meet these new farm operator demands, or go out of business. The chapters dealing with the input side of agriculture are fortified with the kind of practical experience that makes this book "must" reading for anyone concerned with family farm development and policy.

The concluding section of the book examines the changing structure of markets for farm products to accommodate the new demands by businessmen farmers, affluent domestic consumers, and changing world conditions. These chapters clearly indicate the challenges and opportunities for those agricultural marketing firms that choose to accommodate change.

This publication should contribute to a better understanding of the major family farm policy issues.

E. L. Baum

Revolving Finance in Agricultural Cooperatives

By Henry E. Erdman and Grace H. Larsen. Mimir Publishers Inc., Madison. 117 pages. 1965. $3.50.

FARMER COOPERATIVES have used the revolving fund as one of their primary sources of equity capital. The revolving fund can be defined as "a plan by which members of a cooperative currently supply capital to the association in some way proportional to the volume of business they do with it, while periodically funds in excess of capital needs are returned to contributors in the order of their contribution."

Erdman, who has devoted a half century to the study of marketing and cooperative organizations, and his co-author trace the historical development of cooperative revolving funds and discuss their role and possibilities under current conditions.

The process of obtaining investment capital in proportion to membership patronage is of early origin. It may have been used by some of the cooperative cheese associations of New York and other States in the 1850's. The retirement in cash of the oldest outstanding equities, however, developed slowly. It was first adopted by a fruit marketing association in the State of Washington early in 1912, but nearly 20 years passed before revolving finance gained general acceptance. This delay was due mainly to legal complications, the presence of more immediate problems diverting management's attention, and the violent economic changes of the period that upset financial plans.

Erdman and Larsen conclude that cooperative revolving funds are and will continue to be useful as a method of financing farmer cooperatives. The concept of revolving finance, however, should be flexible and, when applied to a particular cooperative business, its form should be adapted to specific and changing needs. The most suitable term of years for revolving the funds will vary among cooperatives.

Individual cooperatives will also differ in the degree that a revolving program is emphasized in their capital structure. In combination with revolving capital, a cooperative's financial structure might, according to the authors, include long-term unamortized mortgages, preferred stock, or other nonvoting securities. The book is not entirely clear in its reference to "permanent debt financing" and it mixes terms usually applied to equity capital with those more frequently used in describing debt capital. Permanent debt capital or credit is not generally available to cooperatives from institutional lenders. Equity capital in the form of preferred stock or some comparable security may be relatively permanent when compared with revolving capital. But it is not permanent when compared to the equity capital of proprietary business in the form of common stock traded in the stock market. Despite the usefulness of revolving funds in cooperatives,

many cooperatives are finding it increasingly difficult to do their entire job of financing with revolving funds.

Individual lenders, including nonoperating owners of farms, are an important source of credit to farmers. The authors conclude that these individuals should not be overlooked as a likely market for cooperative-type issues of preferred stock or certificates of indebtedness. Here the authors appear to have disregarded a basic difficulty confronting farmer cooperatives in raising equity capital. Cooperatives, unlike noncooperative businesses, are not able to offer the incentive of capital gain on their stock sales to offset the risk of loss of value. The need for funds on farms and good corporation stocks with growth possibilities offer strong competition for the funds of potential investors, both members and nonmembers. Besides, since any earnings in excess of regular dividends usually are received by cooperative members or patrons in the form of patronage refunds, these individuals will probably continue to supply most of the equity capital.

In addition to a satisfactory term for the revolving cycle, Erdman and Larsen point out that all revolving funds should include some procedure for informing a member of his interest in the fund, adequate provision in legal instruments for the revolving fund plan, and member and employee education to make this financial plan understood and supported.

This book is intentionally limited in scope and makes its greatest contribution in the historical phase. Nearly two-thirds of the book is devoted to a documented history of the revolving fund plan.

Chapter 6 is entitled "Adjusting Revolving Fund Plans to Meet Current Needs." Possibly it should have been broadened by citing more views and studies, such as Russell C. Engberg's Financing Farmer Cooperatives, to illustrate the current and effective use of revolving funds by individual cooperatives. Nevertheless, the material that is covered makes this work an interestingly presented and useful addition to readings on cooperative finance.

Glenn E. Heitz
G. Robert Butell

An Appraisement of Agricultural Cooperation in Ireland

By Joseph G. Knapp. Government Publications Sales Office, Dublin. 115 pages. 1964. $0.75.

An Analysis of Agricultural Co-operation in England

By Joseph G. Knapp. Agricultural Central Co-operative Association, London. 242 pages. 1965. $2.

IT IS NOT THE objective of this review to give readers a detailed account of the organization and history of agricultural cooperatives in England and Ireland. For such an account, the reader must turn to the two detailed reports which Knapp provided to those who asked him to make these critical analyses. Their request was, "We would wish you to carry out a general appraisal of the position of the cooperative movement in this country and indicate what you think might be done to strengthen it and increase its influence in the agricultural sphere generally."

Because Knapp's analysis is thorough, his reports make a major contribution to an understanding of the basic role of cooperatives in agriculture. The length of these documents makes each of them literally a small book on agricultural cooperation. Both of them reflect the thinking of Knapp on the role of agricultural cooperatives in national economies. He describes this role as that of being "a force to assist farmers in their adjustments to an expanding and changing world." He suggests ways in which agricultural cooperatives in England and Ireland, and in other countries as well, can facilitate this adjustment.

Knapp's first recommendation, made to the leaders of Ireland's agricultural cooperative, is that "steps should be taken to reinvigorate the IAOS (Irish Agricultural Organization Society) as the mother of cooperatives which should provide leadership and the technical services that are necessary to help farmers build strong cooperative organizations capable of meeting the needs of agriculture." This recommendation is based upon the assumption that IAOS should represent the voice of agriculture, not only in the cooperative movement, but in everything which concerns the farm

people of Ireland. The second basic recommendation is made to the leaders of ACCA (Agricultural Central Cooperative Association) in England. He indicates the direction he believes this reorganization should take--a direction which "would make clear the government's confidence in the cooperative form of organization." Again the reviewer must point out that these recommendations can be fully understood only if the reader studies these documents in detail.

In his analysis of these two century-old cooperative societies, Knapp presents his own mature thinking about the role of agricultural cooperatives in the economy and life of any society. This is not to say that he used the opportunity to study the experience of these two cooperatives merely to present his own viewpoint. Although he has dedicated his professional career to working with and for cooperatives, he is not a prejudiced pleader for cooperatives. He is, as he has long been, a dedicated student and an authority on agricultural cooperatives as a necessary part of any national society which depends on the prosperity of its agriculture and of those who constitute the agricultural sector of that society.

It is probably because agricultural cooperatives in Ireland and England never attempted to wield great political influence that they have never experienced a debacle such as occurred after the Farmers' Alliance upheaval in the United States in the late 1880's and early 1890's. Knapp does not, however, designate these as weaknesses on the part of these two cooperatives. Rather, he believes that the principal weakness of these two European agricultural cooperatives is that they have in some ways become too institutionalized to meet the issues incident to the changing role of agriculture in the now universal price and market economy of the western world. Another weakness, he believes, is the inadequacy of "agricultural supply or purchasing cooperatives." While he does not say so, this weakness probably stems from Sir Horace Plunkett's philosophy of the inherent goodness of the rural way of life. Today agriculture is a part of the world price and market economy, and one of its major concerns must be how to become more effective in this economy.

Knapp points out that agricultural cooperatives in Ireland were in the beginning a grass roots or people's movement--a country life movement. They were not primarily marketing organizations, nor were they systematically tied in with other social institutions. There was no systematic instruction on this subject in institutions of higher learning, and no adequate tie-in with government agencies. There was no research on cooperatives by either of these institutions. One of his most forthright recommendations is that such relationships or types of cooperation be established. This is a plea that the leaders of agricultural cooperatives in both of these countries, rather than following the early history of agricultural cooperatives, pit themselves against leaders and agencies of other segments of society and expend their energies and their thoughts on making agriculture a more efficient part of the national economy. To illustrate his points he uses the experiences of the United States, where the Farmer Cooperative Service of the U.S. Department of Agriculture is an integral and respected part of the Federal Government. His recommendations to the leaders of agricultural cooperatives in England and Ireland are not, however, based primarily on a plea that they follow American experiences. They are based on a detailed analysis of their own organizations and experiences.

Knapp interviewed personnel in every echelon of agricultural cooperatives, from top management to farmers. The value of these personal interviews is probably best illustrated in appendix A of his report on agricultural cooperatives in England, in which he records 33 diagnostic questions which he asked managers of cooperatives. The answers they gave provided valuable information to Knapp, but even more important was the fact that they stimulated, one might say forced, the managers of cooperatives to make critical analyses.

I can conclude this review no more aptly than by quoting from the Irish Times which said, concerning Knapp's report and recommendations, that "the hope must be that it marks a new era in the cooperative movement, an era in which the spirit of Sir Horace Plunkett will find a new expression; in which the country-wide system of co-ops will at long last become a people's movement operating for the common

good of farmers and practicing the principle of mutual help. . . . All these objects, while far from achievement, have been given a fillip by Dr. Knapp."

Carl C. Taylor

Rural Recreation for Profit

By Clodus R. Smith, Lloyd E. Partain, and James R. Champlin. Interstate Printers and Publishers Inc., Danville, Ill. 303 pages. 1966. $6.95.

THE AUTHORS STATE that this book was written for the use of rural landowners and others who may be concerned with recreational enterprises as profit bearing ventures. In suggesting the widespread feasibility of rural recreational enterprises, the authors may be overzealous. The extent to which these ventures can be profitable is a question not satisfactorily answered in this book. However, many practical suggestions are given which should help many operators improve their profit positions.

Information is presented in a plain and understandable manner on how to plan, develop, operate, and manage various types of recreational enterprises. Seven types of enterprises are portrayed from the viewpoint of demand, income potential, profitable additions, resource requirements, and management problems. Worthwhile suggestions are given regarding the selection of a recreational enterprise and on planning, developing, maintaining, and managing the selected enterprise.

After each of the 14 chapters, there is a bibliography relating to the material presented in that chapter. In addition, one chapter is devoted to explaining the various technical and financial assistance programs that are available from Federal agencies for those developing and operating recreational enterprises. These references alone, without the other valuable suggestions, make this book a worthwhile source of information for anyone who is planning to operate or is operating a rural recreational enterprise.

Ronald Bird

Selected Recent Research Publications in Agricultural Economics Issued by the U.S. Department of Agriculture and Cooperatively by the State Universities and Colleges[1]

Allen, Philip T. FARM REAL ESTATE CREDIT--AN ANALYSIS OF BORROWERS AND LENDERS. U.S. Dept. Agr., Agr. Econ. Rpt. 104, 40 pp., November 1966.

Identifies borrowers who obtained the principal part of their loan funds from each of eight sources of farm-mortgage credit as well as the kinds of loans these borrowers received from each source. The groups of borrowers are identified by their regional location, the types and sizes of their farms, their ages, and the number of years they operated their present farms.

Andrilenas, Paul, Theodore Eichers, and Austin Fox. FARMERS' EXPENDITURES FOR PESTICIDES IN 1964. U.S. Dept. Agr., Agr. Econ. Rpt. 106, 12 pp., January 1967.

A survey of farmers whose sales represented 90 percent of total agricultural sales in the United States revealed that 94 percent of these farmers used pesticides in 1964 and that their expenditures totaled $456 million. Of the total pesticide expenditures, 85 percent were for treating crops, about 11 percent were for treating livestock and poultry, and 4 percent were for other uses.

Bailey, Warren R. ORGANIZING AND OPERATING DRYLAND FARMS IN THE GREAT PLAINS: SUMMARY OF REGIONAL RESEARCH PROJECT GP-2. U.S. Dept. Agr., Econ. Res. Serv., ERS-301, 60 pp., February 1967. (Agr. Expt. Stas. of Kans., Mont., Nebr., N. Dak., Okla., and Tex. cooperating.)

Gives results of research projects designed to help dryland farmers reduce year-to-year variations in yield and income. Helpful strategies include selecting only those enterprises having low year-to-year variability, combining enterprises with different patterns of year-to-year variability, and using feed reserves.

Bowles, Gladys K., Calvin L. Beale, and Benjamin S. Bradshaw. POTENTIAL SUPPLY AND REPLACEMENT OF RURAL MALES OF LABOR FORCE AGE, 1960-70. U.S. Dept. Agr., Statis. Bul. 378, 152 pp., October 1966.

Compares the number of young men in rural U.S. regions expected to attain the working age of 20 and the number of men in the working ages 20-64 in 1960 who are expected to die or retire during 1960-70. One major finding is that 3 million men aged 20-64 will die or reach retirement age during 1960-70, and about 5.3 million young men will reach working age to replace them.

[1] State publications may be obtained from the issuing agencies of the respective States.

Bullock, J. Bruce, Richard Eisenberg, and Duane Hacklander. PRICE SPREADS FOR PORK. U.S. Dept. Agr., Misc. Pub. 1051, 28 pp., January 1967.

The farm-retail spread for pork increased 9.8 cents between 1949 and 1966 as a result of an 8.6-cent increase in the wholesale-retail spread and a 1.2-cent increase in the farm-wholesale spread. Although the general trend from 1949 to 1959 was upward, price spreads often varied greatly from month to month.

Chumley, Toledo W. ADOPTION OF THE CONTINUOUS MIX PROCESS IN BREAD BAKING: SOME EFFECTS ON FIRMS AND THE INDUSTRY. U.S. Dept. Agr., Econ. Res. Serv., ERS-329, 8 pp., January 1967.

Adoption of the continuous mix process probably will expand sales, service, and other nonproduction jobs, as well as increase skill requirements. The impact on competition in the baking industry has been felt most by small plants in and near areas where continuous mix operations have been introduced.

Faber, Fred L., and Robert J. Van Houten. AN INVENTORY OF MARKET NEWS REPORTS FOR EGGS. U.S. Dept. Agr., Econ. Res. Serv., ERS-332, 24 pp., January 1967.

Presents detailed descriptions of the kinds of market news information on eggs currently available from Federal, State, and private agencies. This report also evaluates the need for modifications in and additions to market news series.

Gale, Hazen F. THE FARM FOOD MARKETING BILL AND ITS COMPONENTS. U.S. Dept. Agr., Agr. Econ. Rpt. 105, 64 pp., January 1967.

The total marketing bill of $49 billion in 1963 was made up of the following: Processors, $19 billion; retailers, $22 billion; and assemblers, transportation agencies, and wholesalers, $8 billion. Fruits and vegetables had the largest marketing bill in 1963, and the meat products group ranked second.

LaFerney, Preston E., Robert A. Mullikin, and Charles S. Shaw. SPINNING QUALITY OF COTTON AS AFFECTED BY GIN CLEANING, CARD CRUSHER ROLLS, AND VARYING CARDING RATES, MISSISSIPPI, 1965-66 SEASON. U.S. Dept. Agr., Mktg. Res. Rpt. 778, 40 pp., December 1966.

A test involving 36 bales of Mississippi Delta cotton harvested in 1965 showed that use of crusher rolls and high production carding could reduce manufacturing costs of cotton. The effects of ginning treatments upon fiber properties or spinning performance were found to be small and usually insignificant.

Leiman, Martin. FOOD RETAILING BY DISCOUNT HOUSES. U.S. Dept. Agr., Mktg. Res. Rpt. 785, 32 pp., February 1967.

Examines the impact of retail food operations by discount houses on conventional retail food distribution in 10 standard metropolitan statistical areas in the United States in January and February 1964. Discount food stores had significantly higher average weekly sales and were open fewer hours during the week than conventional food stores.

Madden, J. Patrick. ECONOMIES OF SIZE IN FARMING: THEORY, ANALYTICAL PROCEDURES, AND A REVIEW OF SELECTED STUDIES. U.S. Dept. Agr., Agr. Econ. Rpt. 107, 88 pp., February 1967.

Reviews various studies of economies of size in crop production, specialized beef feedlots, and dairy farms; discusses the theoretical basis for analyzing economies of size; and examines several alternative analytical procedures.

MacGregor, M. A., and G. Klosler. MARKETING FLUE-CURED TOBACCO IN ONTARIO. Univ. of Guelph, Dept. Agr. Econ., July 1966. (U.S. Dept. Agr. cooperating.)

Describes and analyzes all phases in the marketing of raw leaf tobacco through auction exchanges in Ontario from the 1920's to 1957. Costs of the Ontario system are compared with those of U.S. and Rhodesian systems.

Moe, Lyle E. SAUDI ARABIA: SUPPLY AND DEMAND PROJECTIONS FOR FARM PRODUCTS TO 1975, WITH IMPLICATIONS FOR U.S. EXPORTS. U.S. Dept. Agr., Econ. Res. Serv., ERS-Foreign 168, 32 pp., December 1966.

This summary of the first comprehensive report on Saudi Arabian agriculture, including projections to 1970 and 1975, is part of an effort to evaluate long-term prospects for agricultural products on a global scale. The Saudi Arabian market is heavily weighted on the import side of the ledger because of the country's generally nonrestrictive trade, vast foreign exchange and gold holdings, and hard currency.

Pedersen, John R. COSTS AND ECONOMIES OF SCALE IN EGG-TYPE CHICK HATCHERIES. U.S. Dept. Agr., Mktg. Res. Rpt. 782, 60 pp., February 1967.

The major factors affecting costs of egg-type chick hatcheries include labor and managerial efficiency, utilization of capacity, egg hatchability, distribution of fixed and utility costs over other agricultural enterprises, size of operations, and wage rates. Economies of scale are analyzed for six model chick hatcheries with annual capacities ranging from about 1 to 10 million eggs.

Rapton, Avra. 1965 SUPPLEMENT TO SEASONAL WORK PATTERNS OF THE HIRED FARM WORKING FORCE OF 1964. U.S. Dept. Agr., Agr. Econ. Rpt. 102, 8 pp., February 1967.

Major seasonal patterns of employment in 1965 did not differ to any significant degree from those in 1964, although the number of workers was generally lower in the later year. Seasonal changes among types of workers and geographic regions usually become evident only over several years.

Solberg, Erling D. SUGGESTIONS FOR PLANNING AND ZONING IN APPALACHIA. U.S. Dept. Agr., Econ. Res. Serv., ERS-330, 56 pp., February 1967.

Rural planning and zoning in Appalachia should be designed to foster restoration and economic use of reclaimed mined areas, facilitate the blocking up of forest areas, protect existing and potential recreation areas, and guide suburban encroachment into rural areas.

Starbird, I. R., and F. K. Hines. COSTS OF PRODUCING UPLAND COTTON IN THE UNITED STATES, 1964. U.S. Dept. Agr., Agr. Econ. Rpt. 99, 52 pp., September 1966.

The total cost of producing the U.S. crop of upland cotton in 1964 was 28.4 cents per pound of lint. Estimates of total cost per pound of lint varied from 23.4 cents in the Mississippi Delta Region to 38.1 cents in the Upper Rio Grande-Trans Pecos Region of Texas and New Mexico.

Stauber, B. R. THE COLLECTION OF AGRICULTURAL STATISTICS IN JAPAN. U.S. Dept. Agr., Statis. Rptg. Serv., SRS-10, 48 pp., September 1966.

Japan's Statistics and Survey Division, Economic Bureau, Ministry of Agriculture and Forestry, collects and publishes data on Japan's agriculture, forestry, and fisheries; acreage, production, yield, livestock numbers, and products; management characteristics of farm units; processing and distribution; and numerous collateral aspects of the economy.

U.S. Department of Agriculture. INDICES OF AGRICULTURAL PRODUCTION FOR THE 20 LATIN AMERICAN COUNTRIES (PLUS GUYANA, JAMAICA, AND TRINIDAD AND TOBAGO). Revised 1954 through 1965, Preliminary 1966. Econ. Res. Serv., ERS-Foreign 44, 52 pp., Revised January 1967.

Contains indices of net agricultural production and net food production in Latin America for 1954-66. Major changes in this annual publication include the addition of one new country, Guyana; summaries, by country, of livestock production indices; and aggregate values of agricultural and food production.

U.S. Department of Agriculture. OUR FOREIGN AGRICULTURAL TRADE. Agr. Inform. Bul. 312, 28 pp., December 1966.

From fiscal 1960 to 1966, the value of agricultural exports rose from $4.5 billion to $6.7 billion--a record high increase. The volume of agricultural imports also increased, but much less than exports. In calendar year 1965, for the sixth year in a row, the United States had a favorable agricultural trade balance.

U.S. Department of Agriculture. YOUNG PEOPLE'S USE AND APPRAISAL OF NATURAL AND COMPETING FIBERS IN WEARING APPAREL. Mktg. Res. Rpt. 767, 196 pp., August 1966.

Teenage boys and girls interviewed in this nationwide study reported the advantages and disadvantages of cotton, wool, and cotton-polyester blends. This report is part of a broad program to enable producers of natural fibers to strengthen their market position and to provide consumers with an opportunity to express their reactions to products available to them.

Waugh, Frederick V. GRAPHIC ANALYSIS: APPLICATIONS IN AGRICULTURAL ECONOMICS. U.S. Dept. Agr., Agr. Handb. 326, 80 pp., November 1966.

Graphics is almost indispensable in preliminary analysis of a problem in economics. This handbook elucidates major problems through graphic descriptions of averages, trends, cycles, and seasonals, simple, multiple, and joint regression, and linear programming.

Whittlesey, Norman K. AGGREGATE ECONOMIC EFFECTS OF ALTERNATIVE LAND RETIREMENT PROGRAMS: A LINEAR PROGRAMMING ANALYSIS. U.S. Dept. Agr., Tech. Bul. 1351, 64 pp., August 1966. (Iowa Agr. and Home Econ. Expt. Sta. cooperating.)

Presents an analysis of the impact of selected alternative production control programs on agriculture. Three interregional linear programming models based on spatially separated producing and consuming regions are the methodological basis of the analysis.

Whittlesey, Norman K., Irwin A. Noteboom, and Walter R. Butcher. EFFECT OF PRODUCT PRICE RELATIONSHIPS ON FARM ORGANIZATION AND INCOME IN THE PALOUSE REGION OF WASHINGTON AND IDAHO. Wash. State Univ., Agr. Expt. Sta., Bul. 674, 24 pp., August 1966. (U.S. Dept. Agr. cooperating.)

Focuses on future adjustment possibilities for farmers in the wheat-pea area of eastern Washington and northern Idaho to changing prices of wheat, barley, and livestock. The three farm sizes delineated in the study area consist of 101-450, 451-900, and over 900 crop acres.

U.S. Department of Agriculture. A CENTURY OF AGRICULTURE IN CHARTS AND TABLES. Agr. Handb. 318, 48 pp., July 1966.

U.S. Department of Agriculture. FOOD COSTS--RETAIL PRICES, FARM PRICES, MARKETING SPREADS. Misc. Pub. 856, 16 pp., Revised September 1966.

U.S. Department of Agriculture. LIVESTOCK AND MEAT STATISTICS. Consumer and Mktg. Serv., Statis. Rptg. Serv., and Econ. Res. Serv., Supplement for 1965 to Statis. Bul. 333, 160 pp., August 1966.

U.S. Department of Agriculture. RESEARCH DATA ON MINORITY GROUPS--AN ANNOTATED BIBLIOGRAPHY OF ECONOMIC RESEARCH SERVICE REPORTS: 1955-1965. Misc. Pub. 1046, 28 pp., November 1966.

U.S. Department of Agriculture. U.S. FATS AND OILS STATISTICS, 1909-65. Statis. Bul. 376, 228 pp., August 1966.

U. S. GOVERNMENT PRINTING OFFICE : 1967 O - 258-911

Suggestions for Submitting Manuscripts for Agricultural Economics Research

Each contributor can expedite reviewing and printing his manuscript by doing these things:

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AGRICULTURAL ECONOMICS RESEARCH

Is published quarterly by the Economic Research Service, U.S. Department of Agriculture. Use of funds for printing this publication approved by the Director of the Bureau of the Budget (July 31, 1964).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. 25 cents a single copy, $1 a year domestic, $1.25 foreign.